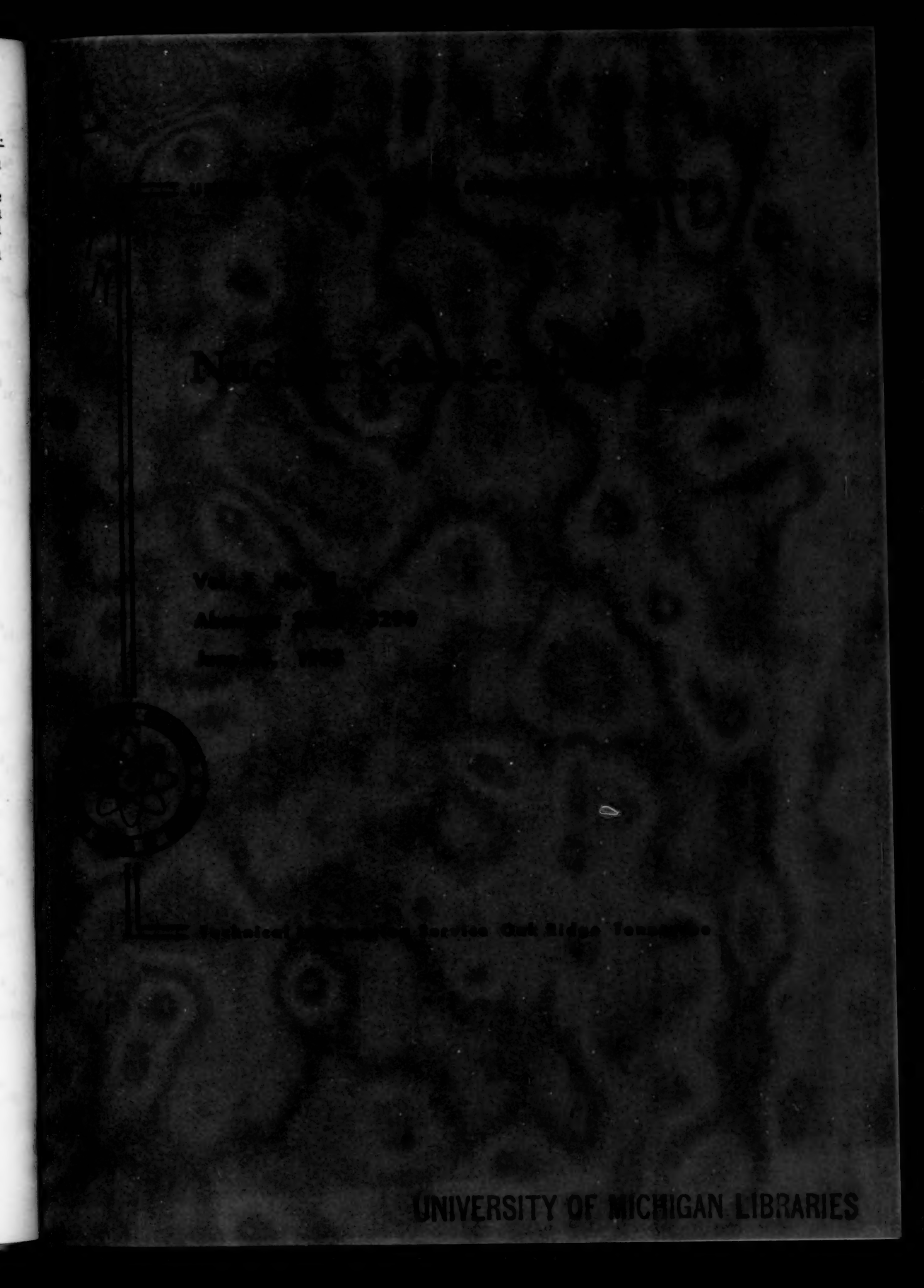

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NYO-4006 2976
Trudeau Foundation, Saranac Lake, N. Y.
EXPERIMENTAL INVESTIGATIONS CONCERNING TOXICITY OF BERYLLIUM; PROGRESS REPORT, PART 1. Mar. 15, 1952. 14p. (NYO-4006)

NYO-4517 3061
Johns Hopkins Univ.
BEHAVIOR OF INSTITUTIONAL INCINERATORS WHEN USED TO BURN RADIOACTIVE WASTES: FINAL PROJECT REPORT [FOR] AUGUST 1, 1950–NOVEMBER 1, 1952. C. W. Kruse, P. V. Freese, A. Machis, and V. C. Behn. Nov. 1, 1952. 58p. (NYO-4517)

ORNL-1313 3041
Oak Ridge National Lab.
PURIFICATION OF FISSION-PRODUCT RARE EARTHS BY ION EXCHANGE. R. S. Pressly and A. F. Rupp. Issued Apr. 20, 1953. 33p. (ORNL-1313)

ORNL-1354 3076
Oak Ridge National Lab.
CRUCIBLE HANDBOOK: A COMPILATION OF DATA ON CRUCIBLES USED FOR CALCINING, SINTERING, MELTING, AND CASTING. M. A. Schwartz, G. D. White, and C. E. Curtis. Issued Apr. 17, 1953. 32p. (ORNL-1354)

ORNL-1479 3159
Oak Ridge National Lab.
A PROTON RECOIL TYPE FAST-NEUTRON SPECTROMETER. R. G. Cochran and K. M. Henry. Issued Apr. 20, 1953. 36p. (ORNL-1479)

ORNL-1492 3141
Oak Ridge National Lab.
INSTRUMENT RESEARCH AND DEVELOPMENT QUARTERLY PROGRESS REPORT FOR PERIOD ENDING JANUARY 20, 1953. Issued Apr. 7, 1953. 35p. (ORNL-1492)

ORNL-1504 3191
Oak Ridge National Lab.
ON THE STATISTICAL THEORY ON NUCLEAR REACTIONS. Bernard L. Cohen. Issued Apr. 20, 1953. 19p. (ORNL-1504)

ORNL-1514 3102
Oak Ridge National Lab.
CONE-ARC WELDING. P. Patriarca and G. M. Slaughter. Issued Apr. 10, 1953. 14p. (ORNL-1514)

ORO-91 2943
Tennessee Univ.
METABOLISM OF CESIUM 137 IN LABORATORY AND DOMESTIC ANIMALS. S. L. Hood and C. L. Comar. [1953]. 31p. (ORO-91)

RME-3046 3077
Columbia Univ.
ANNUAL REPORT FOR JUNE 30, 1952 TO APRIL 1, 1953. Paul F. Kerr, P. K. Hamilton, Gerald P. Brophy, W. L. Simpson, William Cohen, Harry Dahl, and Jack Green. Issued Apr. 1953. 99p. (RME-3046)

RMO-824 3078
Division of Raw Materials, AEC
AN INVESTIGATION OF SUBSURFACE ISORAD METHODS TEMPLE MOUNTAIN, SAN RAFAEL DISTRICT, UTAH. David N. Hinckley. Sept. 2, 1952. (RMO-824)

SO-1009 3062
Illinois Univ. Engineering Experiment Station
[FILTRATION OF SMALL AEROSOL PARTICLES BY FILTER MATS.] W. E. Ranz and R. K. Finn. Jan. 1, 1953. 30p. (SO-1009; Technical Report 8)

TID-3036 3148
Technical Information Service, AEC
ISOTOPE SEPARATION AND ISOTOPE EXCHANGE; A BIBLIOGRAPHY OF UNCLASSIFIED LITERATURE. G. M. Begun, Oak Ridge National Lab. and Robert E. Allen, Technical Information Service, AEC, comps. Jan. 23, 1953. 82p. (TID-3036)

UCLA-242 2944
Atomic Energy Project, Univ. of Calif., Los Angeles
THE EFFECT OF ETHYLENEDIAMINE TETRAACETIC ACID AND OTHER CHELATING AGENTS ON THE ISOLATED MAMMALIAN HEART. James L. Leitch and Thomas J. Haley. Feb. 5, 1953. 13p. (UCLA-242)

UCLA-249 3185
Atomic Energy Project, Univ. of Calif., Los Angeles
THE SIZE OF DESOXYRIBONUCLEIC ACID MOLECULES. Amos Norman and John Rowen. Mar. 19, 1953. 7p. (UCLA-249)

UCLA-251 3042
Atomic Energy Project, Univ. of Calif., Los Angeles
THE CHROMATOGRAPHIC SEPARATION OF THE PLASMA LIPIDS. Dorothy L. Fillerup and James F. Mead. Apr. 1, 1953. 14p. (UCLA-251)

UCRL-2065 3110
Radiation Lab., Univ. of Calif., Berkeley
SUMMARY OF RESEARCH PROGRESS MEETING OF NOVEMBER 20, 1952. Sergey Shewchuck. Dec. 30, 1952. 8p. (UCRL-2065)

UCRL-2083 3142
Radiation Lab., Univ. of Calif., Berkeley
RECORDING PULSE HEIGHT ANALYZER. William Goldsworthy. Jan. 27, 1953. 18p. (UCRL-2083)

UCRL-2088 3160
Radiation Lab., Univ. of Calif., Berkeley
SCINTILLATION HAND AND FOOT COUNTER. William Goldsworthy. Jan. 27, 1953. 13p. (UCRL-2088)

UCRL-2105 3001
Radiation Lab., Univ. of Calif., Berkeley
EMPIRICAL CONSIDERATIONS OF ENTROPY. 3. A STRUCTURAL APPROACH TO THE ENTROPIES OF AQUEOUS ORGANIC SOLUTES AND COMPLEX IONS. James W. Cobble. Feb. 3, 1953. 24p. (UCRL-2105)

UCRL-2109 3220
Radiation Lab., Univ. of Calif., Berkeley
THE $T^3(p,\gamma)He^4$ REACTION. Robert W. Birge and John Jungerman. Feb. 11, 1953. 12p. (UCRL-2109)

UCRL-2111 2956
Radiation Lab., Univ. of Calif., Berkeley
MEDICAL AND HEALTH PHYSICS QUARTERLY REPORT [FOR] OCTOBER, NOVEMBER, AND DECEMBER 1952. Feb. 18, 1953. 91p. (UCRL-2111)

UCRL-2111(p.3-75) 2957
Radiation Lab., Univ. of Calif., Berkeley
THE METABOLIC PROPERTIES OF VARIOUS MATERIALS. p.3-75 of MEDICAL AND HEALTH PHYSICS QUARTERLY REPORT [FOR] OCTOBER, NOVEMBER, AND DECEMBER 1952. Feb. 18, 1953. 73p. (UCRL-2111(p.3-75))

UCRL-2111(p.76-91) 2958
Radiation Lab., Univ. of Calif., Berkeley
BIOLOGICAL STUDIES OF RADIATION EFFECTS AND HEALTH CHEMISTRY AND PHYSICS. p.76-91 of MEDICAL AND HEALTH PHYSICS QUARTERLY REPORT [FOR] OCTOBER, NOVEMBER, AND DECEMBER 1952. Feb. 18, 1953. 16p. (UCRL-2111(p.76-91))

UCRL-2113 3174
Radiation Lab., Univ. of Calif., Berkeley
π^- AND μ^- MESON-INDUCED FISSION. Walter John and William F. Fry. Mar. 4, 1953. 9p. (UCRL-2113)

UCRL-2116 3030
Radiation Lab., Univ. of Calif., Berkeley
OBSERVATIONS ON THE RADIATION DECOMPOSITION OF SOME C^{14}-LABELED COMPOUNDS. B. M. Tolbert, P. T. Adams, Edward L. Bennett, Ann M. Hughes, Martha R. Kirk, R. M. Lemmon, R. M. Noller, R. Ostwald, and Melvin Calvin. Feb. 27, 1953. 10p. (UCRL-2116)

UCRL-2117 3231
Radiation Lab., Univ. of Calif., Berkeley
ALTERNATING GRADIENT LENSES FOR REDUCING THE AREA OF A BEAM. Craig Nunan. Mar. 2, 1953. 11p. (UCRL-2117)

UCRL-2122 2945
Radiation Lab., Univ. of Calif., Berkeley
SUMMARY OF RESEARCH PROGRESS MEETINGS OF JANUARY 8, 22, 29, AND FEBRUARY 5, 1953. Sergey Shewchuck. Mar. 13, 1953. 6p. (UCRL-2122)

UCRL-2126 3285
Radiation Lab., Univ. of Calif., Berkeley
NOTE ON COORDINATE TRANSFORMATIONS AND SOLID ANGLE JACOBIAN FOR CHARGED PARTICLES IN A MAGNETIC FIELD. Walter H. Barkas. Mar. 10, 1953. 6p. (UCRL-2126)

UCRL-2130 3014
Radiation Lab., Univ. of Calif., Berkeley
THE CRYSTAL STRUCTURE OF HIGH CYCLOBUTANE. Giles F. Carter and D. H. Templeton. Mar. 3, 1953. 4p. (UCRL-2130)

UCRL-2134 3154
Radiation Lab., Univ. of Calif., Berkeley
ON THE NUMBER OF FEYNMAN DIAGRAMS. Robert J. Riddell, Jr. Mar. 5, 1953. 21p. (UCRL-2134)

UCRL-2172 3260
Radiation Lab., Univ. of Calif., Berkeley
NOTE ON THE DECAY OF Rb^{82}. Harry T. Easterday. Apr. 2, 1953. 6p. (UCRL-2172)

UCRL-2173 3261
Radiation Lab., Univ. of Calif., Berkeley
THE DECAY OF Cr^{49}. Bernd Crasemann and Harry T. Easterday. Mar. 31, 1953. 4p. (UCRL-2173)

UR-224 2982
Atomic Energy Project, Univ. of Rochester
POLONIUM INDUCED ANEMIA IN RATS AS STUDIED WITH ALPHA-C^{14}-GLYCINE. R. G. Thomas, K. I. Altman, J. N. Stannard, and K. Salomon. Dec. 9, 1952. 13p. (UR-224)

UR-236 3002
Atomic Energy Project, Univ. of Rochester
THE STABILITY OF COMPLEXES BETWEEN CALCIUM AND ORTHOPHOSPHATE, POLYMERIC PHOSPHATE, AND PHYTATE. R. E. Gosselin and E. R. Coghlan. Jan. 22, 1953. 17p. (UR-236)

UR-237 2946
Atomic Energy Project, Univ. of Rochester
THE RELATIONSHIP OF THE CELL SURFACE TO METABOLISM. 9. THE DIGESTION OF PHOSPHORYLATED COMPOUNDS BY ENZYMES LOCATED ON THE SURFACE OF THE INTESTINAL CELL. Aser Rothstein, Rebecca Meier, and Thomas Scharff. Feb. 3, 1953. 15p. (UR-237)

UR-239 2959
Atomic Energy Project, Univ. of Rochester
COMPARISON OF PATHOLOGIC EFFECTS OF RADIATION IN WEANLING AND ADULT RATS. George W. Casarett. Feb. 17, 1953. 25p. (UR-239)

UR-242 2960
Atomic Energy Project, Univ. of Rochester
QUARTERLY TECHNICAL REPORT [FOR] OCTOBER 1, 1952 THRU DECEMBER 31, 1952. Feb. 26, 1953. 41p. (UR-242)

OTHER UNCLASSIFIED REPORTS OF SPECIAL INTEREST TO AEC LABORATORIES

AERE-C/R-966 3156
Atomic Energy Research Establishment, Harwell, Berks (England)
THE QUENCHING ACTION OF PLUTONIUM AND IRON ON THE FLUORESCENCE OF URANIUM IN SODIUM FLUORIDE PHOSPHORS. G. N. Walton, G. Hutton, and J. A. W. Dalziel. July 30, 1952 42p. (AERE-C/R-966)

AERE-EL/M-78 3151
Atomic Energy Research Establishment, Harwell, Berks (England)
THE HARWELL COMPUTER. E. H. Cooke-Yarborough. Mar. 3, 1953. 5p. (AERE-EL/M-78)

AERE-EL/R-1073 3157
Atomic Energy Research Establishment, Harwell, Berks (England)
CHARACTERISTICS OF BF_3 COUNTERS AND PRECAUTIONS TO BE ADOPTED IN THEIR USE. J. Sharpe and P. G. Salmon. Dec. 3, 1952. 12p. (AERE-EL/R-1073)

AERE-G/M-144 3156
Atomic Energy Research Establishment, Harwell, Berks (England)
A FULL RADIATION PYROMETER SUITABLE FOR TEMPERATURE MEASUREMENTS IN THE RANGE 0° TO 100°C. M. G. Davies and H. Kronberger. Sept. 21, 1951. 7p. (AERE-G/M-144)

AERE-G/R-929 2994
Atomic Energy Research Establishment, Harwell, Berks (England)
DEHYDRATION OF LOW VALENCY INORGANIC HALIDES. E. R. Harrison. July 26, 1952. 13p. (AERE-G/R-929)

AERE-I/R-1038 3146
Atomic Energy Research Establishment, Harwell, Berks (England)
PRODUCTION OF ^{131}I FROM PILE-IRRADIATED TELLURIUM. B. J. Miles, C. W. Fletcher, R. A. Faires, B. R. Payne, and F. Hudswell. Oct. 10, 1952. 15p. (AERE-I/R-1038)

AERE-M/R-1034 3252
Atomic Energy Research Establishment, Harwell, Berks (England)
THE SOLUBILITY AND MOLECULAR SIZE DISTRIBUTION OF CROSSLINKED POLYSTYRENE. A. Charlesby. Nov. 18, 1952. 11p. (AERE-M/R-1034)

AERE-M/R-1040 2995
Atomic Energy Research Establishment, Harwell, Berks (England)
THE INHIBITION OF GAS PHASE REACTIONS OF ZIRCONIUM BY ANODIC OXIDE FILMS. PART 1. J. J. Polling and A. Charlesby. Nov. 13, 1952. 18p. (AERE-M/R-1040)

AERE-M/R-1051 3253
Atomic Energy Research Establishment, Harwell, Berks (England)
THE SWELLING PROPERTIES OF POLYSTYRENE CROSS-LINKED BY HIGH ENERGY RADIATION. A. Charlesby. Nov. 18, 1952. 11p. (AERE-M/R-1051)

AERE-M/R-1058 3073
Atomic Energy Research Establishment, Harwell, Berks (England)
RHEOLOGICAL PROPERTIES OF GLASS AND SODIUM FLUORIDE AT ELEVATED TEMPERATURES. E. B. Allison. Nov. 1952. 25p. (AERE-M/R-1058)

AERE-M/R-1097 3075
Atomic Energy Research Establishment, Harwell, Berks (England)
FREE LIME IN SINTERED CALCIUM FLUORIDE CRUCIBLES. P. Murray and J. Taylor. Jan. 15, 1953. 21p. (AERE-M/R-1097)

AERE-M/R-1104 3088
Atomic Energy Research Establishment, Harwell, Berks (England)
THE THEORY OF D_0 IN THE ARRHENIUS EQUATION FOR SELF DIFFUSION IN CUBIC METALS. A. D. Le Claire. Jan. 20, 1953. 19p. (AERE-M/R-1104)

AERE-T/R-1072 3229
Atomic Energy Research Establishment, Harwell, Berks (England)
A DIVIDED DRIFT-TUBE FOR FOCUSSING A PROTON LINEAR ACCELERATOR. J. S. Bell. Nov. 1952. 8p. (AERE-T/R-1072)

AERE-T/R-1114 3230
Atomic Energy Research Establishment, Harwell, Berks (England)
BASIC ALGEBRA OF THE STRONG FOCUSSING SYSTEM. J. S. Bell. Jan. 1953. 12p. (AERE-T/R-1114)

ATI-81816 3108
Cryogenic Lab., Ohio State Univ.
THERMAL, STRUCTURAL, ELECTRICAL, MAGNETIC AND OTHER PHYSICAL PROPERTIES OF TITANIUM, ZIRCONIUM, HAFNIUM, AND THORIUM, AND SOME OF THEIR SIMPLE COMPOUNDS. 1. TITANIUM, ITS HYDRIDES, OXIDES, HALIDES, NITRIDE, CARBIDE, AND THE ALKALINE EARTH TITANATES. G. B. Skinner, C. W. Beckett, and H. L. Johnston. Jan. 1, 1950. 136p. (ATI-81816; Technical Report 102-AC49/2-100-1)

ATI-108739 3089
New York State Coll. of Ceramics, Alfred Univ.
HOT PRESSING OF TITANIUM CARBIDE. J. R. Tinklepaugh and Eugene W. Holman. Mar. 1951. 21p. (ATI-108739; AF-TR-6537)

CREL-529 2970
Chalk River Project (Canada)
HAZARD DUE TO BETA RADIATION FROM FISSION PRODUCTS DEPOSITED ON THE GROUND AFTER AN ATOMIC EXPLOSION. F. S. Goulding and G. Cowper. Jan. 1953. 14p. (CREL-529)

DF-52GL128 3109
General Engineering Lab., General Electric Co.
THERMAL STRESSES IN CYLINDERS. H. Poritsky and M. F. Bolster. May 20, 1952. 42p. (DF-52GL128)

GEL-57 3254
General Engineering Lab., General Electric Co.
EFFECTS OF RADIATION ON ORGANIC MATERIALS. 2. J. W. Ryan. Dec. 5, 1952. 32p. (GEL-57; DF52GL242)

NAA-AL-1560 3091
North American Aviation, Inc.
TITANIUM BRAZING. Harlan L. Meredith. Nov. 13, 1952. 13p. (NAA-AL-1560)

NACA-RM-E52L24a 3065
Lewis Flight Propulsion Lab., NACA
SMOKE STUDIES OF SECONDARY FLOWS IN BENDS, TANDEM CASCADES, AND HIGH-TURNING CONFIGURATIONS. Arthur G. Hansen, Howard Z. Herzig, and George R. Costello. Mar. 11, 1953. 33p. (NACA-RM-E52L24a)

NACA-RM-E53B17 3066
Lewis Flight Propulsion Lab., NACA
ANALYSIS OF HEAT TRANSFER AND FLUID FRICTION FOR FULLY DEVELOPED TURBULENT FLOW OF SUPERCRITICAL WATER WITH VARIABLE FLUID PROPERTIES IN A SMOOTH TUBE. Robert G. Deissler and Maynard F. Taylor. Apr. 9, 1953. 29p. (NACA-RM-E53B17)

NBS-2281 3139
National Bureau of Standards
CATHODE-RAY-OSCILLOGRAPH BEAM INTENSIFICATION. John H. Park and H. N. Cones. Feb. 1953. 20p. (NBS-2281)

NBS-2330 3140
Radiation Physics Lab., National Bureau of Standards
VOLTAGE SUPPLIES USED IN THE RADIATION PHYSICS LABORATORY. Louis Costrell. Mar. 6, 1953. 11p. (NBS-2330)

NBS-2368 3158
Radiation Physics Lab., National Bureau of Standards
STUDIES OF PROTOTYPE MODELS OF BECKMAN, CAMBRIDGE, KELEKET, AND VICTOREEN 20-R AND 100-R ORGANIZATIONAL DOSIMETERS. Richard A. Elmendorf. Mar. 17, 1953. 25p. (NBS-2368)

NM-006-012.04.61 2972
Naval Medical Research Inst., Bethesda
ABSORPTION OF X-RAYS BY TISSUES OF THE HEAD AND NECK. M. G. Wheatcroft and J. E. Morgan. Dec. 16, 1952. 7p. (NM-006-012.04.61)

NM-007-099 3052
Naval Medical Research Inst., Bethesda
SYNTHESIS OF l-PHENYLALANINE CONTAINING ISOTOPIC NITROGEN. Henry David Baldridge, Jr., William J. McCarville, and Julius Sendroy, Jr. Nov. 5, 1952. 9p. (NM-007-099; Report 1)

NP-4491 3092
Missouri Univ. School of Mines and Metallurgy
ELECTRODEPOSITION OF TITANIUM; PROGRESS REPORT [FOR] OCTOBER 15 TO DECEMBER 15, 1952. 12p. (NP-4491; Progress Report 4)

NP-4496 3093
New York Univ. Coll. of Engineering
HABIT PLANE DETERMINATION OF BETA IN ALPHA TITANIUM; FINAL REPORT. P. Albert. Dec. 5, 1952. 18p. (NP-4496; WAL-401/14-32)

NP-4497 3188
Carnegie Inst. of Tech.
GRAPHICAL METHOD FOR OBTAINING PHASE SHIFTS FROM THE EXPERIMENTAL DATA ON MESON-NUCLEON SCATTERING; RESEARCH AND DEVELOPMENT OF PHENOMENA RELATING TO THE INTERACTIONS OF PARTICLES AND OF RADIATION; TECHNICAL REPORT [FOR] JANUARY 1, 1952 TO DECEMBER 31, 1952. Julius Ashkin and Seymour H. Vosko. Feb. 2, 1953. 12p. (NP-4497; Technical Report 2)

NP-4498 3189
Carnegie Inst. of Tech.
TENSOR OPERATORS IN ISOTOPIC SPIN SPACE; RESEARCH AND DEVELOPMENT OF PHENOMENA RELATING TO THE INTERACTIONS OF PARTICLES AND OF RADIATION; TECHNICAL REPORT [FOR] JANUARY 1, 1952 TO DECEMBER 31, 1952. L. Wolfenstein. Feb. 2, 1953. 14p. (NP-4498; Technical Report 3)

NP-4500 3190
Carnegie Inst. of Tech.
COULOMB INTERFERENCE EFFECTS IN THE SCATTERING OF MESONS BY PROTONS; RESEARCH AND DEVELOPMENT OF PHENOMENA RELATING TO THE INTERACTIONS OF PARTICLES AND OF RADIATION; TECHNICAL REPORT [FOR] JANUARY 1, 1952 TO DECEMBER 31, 1952. Julius Ashkin and Lloyd Smith. Feb. 2, 1953. 17p. (NP-4500; Technical Report 1)

NP-4501 3067
Massachusetts Inst. of Tech.
BOILING HEAT TRANSFER PROJECT MONTHLY PROGRESS REPORT. George Henry, Milton W. Raymond, and Joseph B. Walsh. Mar. 1, 1953. 21p. (NP-4501)

NP-4503 3009
Tour, Sam, and Co., Inc.
RESEARCH AND DEVELOPMENT OF METHODS OF CHEMICAL ANALYSIS FOR TITANIUM METAL AND ALLOYS; FINAL TECHNICAL REPORT. Henry Suss, Gregory Pantchenko, Anna Aronson, and Doris C. Sutton. Mar. 2, 1953. 148p. (NP-4503; WAL-401/48/A-21)

NP-4504 3117
Rochester Univ.
HIGH ENERGY NUCLEAR INTERACTIONS IN LEAD AND LIGHT ELEMENTS. M. F. Kaplon, D. M. Ritson, and W. D. Walker. Mar. 31, 1953. 7p. (NP-4504)

NP-4505 3094
Carnegie Inst. of Tech.
THE EFFECTS OF GEOMETRY OF NOTCH AND SPEED OF TESTING ON THE FATIGUE PROPERTIES OF TITANIUM. J. P. Romualdi and E. D'Appolonia. Mar. 1953. 24p. (NP-4505; WAL-401/68-22)

NP-4506 3095
Battelle Memorial Inst.
THE PLASTIC DEFORMATION OF SINGLE CRYSTALS OF ALUMINUM; SUMMARY REPORT. R. D. Johnson, A. P. Young, W. B. Wilson, and A. D. Schwope. Oct. 10, 1952. 61p. (NP-4506)

NP-4511 3152
Reeves Instrument Corp.
SIMULATION AND COMPUTING TECHNIQUES, PART 2; SYMPOSIUM 2 [HELD IN] NEW YORK CITY, APRIL 28–MAY 2, 1952. 253p. (NP-4511)

NP-4515 3096
Institute of Engineering Research, Univ. of Calif., Berkeley
THE EFFECT OF $CuAl_2$ DISPERSIONS ON THE FATIGUE OF ALUMINUM-COPPER ALLOYS. Robert B. Shaw. Apr. 1, 1953. 27p. (NP-4515; Technical Report 26)

NP-4521 3097
Rutgers Univ. Coll. of Engineering
STUDY OF CRYSTAL IMPERFECTIONS OF POLYCRYSTALLINE MATERIALS, PART 3; TECHNICAL REPORT [FOR] JULY 1951–MARCH 1953. Sigmund Weissmann and Doris Evans. Mar. 6, 1953. 109p. (NP-4521; Technical Report 3)

PTP-289 3005
Chemical Defence Experimental Establishment, Porton Wilts (England)
THE EFFECT OF THE ELECTRIC CHARGE DISTRIBUTION ON THE AGEING OF AN AEROSOL. T. Gillespie. June 26, 1952. 26p. (PTP-289)

RM-646(RAND) 3135
RAND Corp.
THE VISCOSITY OF POLAR GASES. F. J. Krieger. July 1, 1951. 23p. (RM-646(RAND))

TEI-268 3079
Geological Survey
A PRELIMINARY DETERMINATION OF THE AGE OF SOME COLORADO PLATEAU URANIUM ORES BY THE LEAD-URANIUM METHODS. L. R. Stieff, T. W. Stern, and R. G. Milkey. Jan. 1953. 50p. (TEI-268)

TEI-296(pt.1) 3080
Geological Survey
RADIOMETRIC RECONNAISSANCE NEAR MONTEZUMA, SUMMIT COUNTY, COLORADO. McClelland G. Dings. Feb. 1953. 12p. (TEI-296(pt.1))

TEM-507 3081
Geological Survey
WAVELLITE SPHERULITES IN THE BONE VALLEY FORMATION OF CENTRAL FLORIDA. M. H. Bergendahl. Feb. 1953. 14p. (TEM-507)

TEM-509 3082
Geological Survey
PROGRESS REPORT ON ORIGINAL-STATE CORE STUDIES. G. E. Manger, Geological Survey and G. L. Gates, Bureau of Mines. Jan. 1953. 21p. (TEM-509)

U-23153 3046
Rock Island Arsenal Lab.
RADIOMETRIC STUDY OF THE ADSORPTION CHARACTERISTICS OF STEARIC ACID. Stanley L. Eisler. June 20, 1952. 29p. (U-23153; Report 18)

USNRDL-380 2961
Naval Radiological Defense Lab.
RADON INHALATION STUDIES IN RATS. S. H. Cohn, R. K. Skow, and J. K. Gong. Nov. 17, [1952]. 17p. (USNRDL-380)

USNRDL-386 2962
Naval Radiological Defense Lab.
PHOSPHOLIPID CHANGES IN RAT SKIN AFTER EXPOSURE TO THERMAL ENERGY. W. Lee, A. K. Davis, C. Entenman, and G. E. Sheline. Jan. 29, 1953. 23p. (USNRDL-386)

WAL-401/14-30 3103
New York Univ.
BINARY ALLOYS OF TITANIUM WITH CARBON, NITROGEN, OXYGEN AND BORON; FINAL REPORT. Irving Cadoff and A. E. Palty. Oct. 31, 1952. 108p. (WAL-401/14-30)

NUCLEAR SCIENCE ABSTRACTS

Vol. 7 June 15, 1953 No. 11

GENERAL

RESEARCH PROGRAMS

2940

Engineering Research Inst., Univ. of Mich.

UTILIZATION OF THE GROSS FISSION PRODUCTS; PROGRESS REPORT. L. E. Brownell, L. C. Anderson, H. J. Gomberg, J. J. Martin, W. W. Meinke, R. B. Morrison, L. Thomassen, G. J. Van Wylen, E. T. Vincent, and R. A. Wolfe. Mar. 1953. 128p. (COO-124; Progress Report 4)

The fundamental study of the effect of radiation on combustion engine performance has continued with the design and installation of equipment to study combustion under explosive conditions over a pressure range up to a maximum of several thousand psi. Additional tests have been performed with an experimental diesel engine using large amounts (up to 1200 c) of Pd^{109} in the form of seven Pd rods inserted into the combustion chamber. These tests indicated that radiation had little influence on the performance of the diesel engine, contrary to previous results in which lesser amounts of radiation seemed to produce an improvement in engine performance. In the experiments on the performance of jet burners, it was found that radiation had little or no influence on the performance of the burner. The study of the effect of radiation on the promotion of chemical reactions has produced a number of interesting results. It has been found that γ radiation readily promotes the chlorination of benzene by substitution to produce benzene hexachloride. Gamma radiation also promotes the chlorination of toluene. Ethylene can be polymerized under the influence of γ radiation to produce a polymer having properties which differ from the conventional polymer produced by existing methods. Sulfurous acid can be converted to sulfuric acid by passing O_2 through sulfurous acid in the presence of γ radiation. Cooperative research investigations were made with other projects. Blood fractions were irradiated in an attempt to find a means for destroying the virus of serum hepatitis. Preliminary results were favorable. Irradiation of meat contaminated with trichinae larvae was performed. It was found that the cycle of trichinosis can be broken by a light dose of γ radiation (about 12,000 rep). Irradiating processed meat indicated that Na nitrate and nitrite aid in protecting the flavor of meat exposed to radiation. Peroxide values were determined for irradiated fats and it was found that pork fats undergo the greatest increase in peroxide value. Peroxide values were not consistent with organoleptic tests. (For preceding report see COO-91.) (auth)

BIOLOGY AND MEDICINE

2941

Amherst Coll.

UTILIZATION OF GUANINE BY TETRAHYMENA GELEII. M. R. Heinrich, Virginia C. Dewey, and G. W. Kidder. [1952]. 7p. (AECU-2487)

Metabolism studies, using guanine-8-C^{14}, indicate that Tetrahymena geleii protozoa utilize exogenous purine exclusively and do not synthesize purine from smaller precursors. (C.H.)

2942

Laboratory of Biochemistry, Univ. of Ill.

LACTOSE METABOLISM. 2. THE CONVERSION OF GALACTOSE TO GLUCOSE DERIVATIVES IN L. BULGARICUS STRAIN GERE A. W. J. Rutter and R. G. Hansen. [1953] 19p. (AECU-2497)

The mechanism of conversion of galactose to glucose derivatives in the case of extracts from L. bulgaricus strain Gere A is presented and discussed in detail. (C.H.)

2943

Tennessee Univ.

METABOLISM OF CESIUM 137 IN LABORATORY AND DOMESTIC ANIMALS. S. L. Hood and C. L. Comar. [1953]. 31p. (ORO-91)

The uptake, distribution, excretion, and placental transfer of tracer amounts of Cs^{137} in rats, cattle, sheep, swine, and chickens were studied. High absorption of ingested Cs^{137}, appreciable long-term retention, non-logarithmic excretion, and species differences in excretory route and quantity were observed. Tissue concentration patterns were remarkably constant between species and between tissues. Muscles had the highest concentrations and bone and plasma the lowest. Very young animals and fetuses had a lowered tissue-concentrating ability. Tissues accumulated Cs^{137} against a concentration gradient. Ingested Cs^{137} may render the animal unfit as a source of meat, milk, or eggs. (auth)

2944

Atomic Energy Project, Univ. of Calif., Los Angeles

THE EFFECT OF ETHYLENEDIAMINE TETRAACETIC ACID AND OTHER CHELATING AGENTS ON THE ISOLATED MAMMALIAN HEART. James L. Leitch and Thomas J. Haley. Feb. 5, 1953. 13p. (UCLA-242)

A series of chelation agents has been examined for their myocardial effects. All of the compounds produced a negative inotropic effect upon the isolated guinea pig heart and, with the exception of diethylenetriaminepentaacetic acid, they increased coronary flow. It has been shown that the site of action of EDTA is on the cell surface. Calcium has a detoxifying action insofar as EDTA is concerned, and this action is dependent on both pH and Ca^{++} concentration. Furthermore, it was shown that the myocardial effects observed when both Ca^{++} and EDTA were present was the algebraic sum of the effects of both agents. (auth)

2945

Radiation Lab., Univ. of Calif., Berkeley

SUMMARY OF RESEARCH PROGRESS MEETINGS OF JANUARY 8, 22, 29, AND FEBRUARY 5, 1953. Sergey Shewchuck. Mar. 13, 1953. 6p. (UCRL-2122)

I. Problems of Underwater Swimming. Hugh Bradner. Physiological factors and mechanical problems of underwater swimming are summarized briefly. II. Secondary Particles Resulting from 375-Mev Alpha Bombardment. R. W. Deutsch. This talk has been summarized in an abstract report UCRL-1975 by R. W. Deutsch and W. H. Barkas. III. Spectrum of Particles Emitted from a Thin Pb Target When Bombarded with 32-Mev Protons. George Igo. This talk has

been summarized in an abstract report UCRL-1994 by Robert M. Eisberg and George J. Igo. (L.T.W.)

2946

Atomic Energy Project, Univ. of Rochester

THE RELATIONSHIP OF THE CELL SURFACE TO METABOLISM. 9. THE DIGESTION OF PHOSPHORYLATED COMPOUNDS BY ENZYMES LOCATED ON THE SURFACE OF THE INTESTINAL CELL. Aser Rothstein, Rebecca Meier, and Thomas Scharff. Feb. 3, 1953. 15p. (UR-237)

There is little or no direct absorption of glucose phosphate from the small intestine of the rat. However, glucose-1-phosphate is very rapidly hydrolyzed in intestinal loops at a maximal rate of 3.6 millimole/hr for the entire small intestine. One product, orthophosphate, can be almost completely recovered in the loop. The other product, glucose, can be only partially recovered due to absorption. The rate of hydrolysis of glucose-1-phosphate is about the same in all parts of the small intestine and is the same in excised loops as in in vivo loops. In contrast the absorption of glucose is decreased along the length of the intestine from the stomach to colon, and is markedly reduced in excised loops. Eight other phosphate compounds were tested and all were hydrolyzed to some extent in the intestinal loops. When glucose-1-phosphate with P^{32} incorporated is hydrolyzed, there is no interchange of labeled P with the phosphate of the intestinal cell, indicating that the hydrolysis is not taking place in the interior of the cells. Phosphatase is not secreted into the loop under the conditions of these experiments. Therefore it is concluded that the phosphatases are bound on the surface of the intestinal cells. (auth)

2947

COLLAGEN-CRYSTAL RELATIONSHIPS IN BONE AS SEEN IN THE ELECTRON MICROSCOPE. R. A. Robinson and M. L. Watson. Anat. Record 114, 383-410(1952) Nov.

Thin sectioning of bone permits electron microscope and diffraction examinations to be made of small areas of undecalcified bone. The resolution of the electron microscope allows observation of single crystal-collagen fiber relationship. Well over half the volume of the organic matrix of bone is occupied by collagen. The collagen fibers have a regular thickness of about 800 A. The major bands of the collagen are in register across many collagen fibers. The fibers characteristically possess a doublet banding which occupies 400 to 500 A in the direction of the length of the fiber. There is a suggestion of bridging between the doublets of adjacent fibers. In undecalcified bone the vicinity of the doublet is occupied by inorganic bone crystals. These crystals which are tabular in shape have a length in the direction of the fiber which rarely exceeds 450 A. The most probable crystal length is 350 to 400 A. The width of the crystals may be comparable to the length and the thickness and lies between 25 and 50 A. Diffraction patterns of sections confirm the view that the c-axis of the crystal unit cell is nearly parallel to the fiber axis. (auth)

2948

THE FRACTIONATION OF HYDROGEN ISOTOPES IN BIOLOGICAL SYSTEMS. M. L. Eidinoff, G. C. Perri, J. E. Knoll, B J. Marano, and J. Arnheim. J. Am. Chem. Soc. 75, 248-9(1953) Jan. 5.

Rats were injected intraperitoneally with water containing D and T in order to bring the D body-water level up to ~2%, then were supplied dringking water having the same T/D ratio for several days to maintain this level. Analysis of the glycogen and fatty acid fractions of the livers showed a preferential incorporation of the D by ~8 and ~18%, respectively. The results support the conclusion that a preferential incorporation of H relative to D is occurring simultaneously and is probably of magnitude comparable with the D/T factors. (G.Y.)

2949

THERMODYNAMIC STUDY OF SOME ENZYME-INHIBITOR COMPLEXES OF CHYMOTRYPSIN. II. Fred Vaslow and David G. Doherty. J. Am. Chem. Soc. 75, 928-31(1953) Feb. 20.

An abstract of this material was indexed as report AECU-1875 and appears in Nuclear Science Abstracts as NSA 6-1945. (G.Y.)

RADIATION EFFECTS

2950

Chicago Medical School, Chicago

LATENT CARCINOGENIC ACTION ON BETA IRRADIATION ON MOUSE EPIDERMIS. Philippe Shubik, A. Robert Goldfarb, A. C. Ritchie, and Hermann Lisco. [1952]. 3p. (AECU-2471)

Mice irradiated on a small skin area with 800 rep β radiation from a Tl^{204} source showed no tumors after 8 months, while mice similarly exposed and subsequently treated on the exposed skin area with bi-weekly applications of a 5% solution of croton oil showed six animals bearing 13 tumors out of 17 survivors. (C.H.)

2951

New England Deaconess Hospital, Boston

EFFECTS OF IONIZING RADIATION ON THE ADULT AND EMBRYONIC NERVOUS SYSTEM. Samuel P. Hicks. New England Deaconess Hospital and Harvard Medical School, Boston and Pondville State Hospital, Walpole, Mass. [1953]. 37p. (AECU-2480)

The effects of ionizing radiations on the adult and developing nervous system are reviewed. For practical purposes the radiation damage to the adult central nervous system is a secondary late effect that results from slowly developing vascular damage. After high dosage, acute endothelial damage with thrombosis may account for parenchymal changes. The developing nervous system is radiosensitive and serious malformations may follow irradiation of the embryo or fetus in utero. Animal experiments have shown that the neuroblast is one of the cells most easily destroyed by radiation and is perhaps approached in this respect only by the lymphocyte and erythroid cell when they are in a stage of maturation comparable to the neuroblast. The action of radiation on the cell may largely be explained by its production of ions and oxidizing substances that alter enzyme function. (auth)

2952

Pittsburgh Univ. School of Medicine

THE RELATION BETWEEN MORPHOLOGIC AND IMMUNOLOGIC CHANGES CAUSED BY RADIATION. Frank J. Dixon and David W. Talmage. [nd] 2p. (AECU-2489)

The antibody response can be divided into an initial radiosensitive phase lasting only a few hours and a subsequent radioresistant phase lasting for the remainder of the period of antibody production. The first phase is completely suppressed by small amounts of radiation given before the antigen. In the rabbit 200 to 300 r of whole-body radiation given 2 days to several weeks before an antigen prevents an antibody response. The morphologic changes resulting from this amount of x radiation are minimal and transient and limited chiefly to the lymphoid tissue, bone marrow, and gonads. Histologic recovery is complete within 1 to 2 weeks, long before recovery of the immune system. Radiation will not suppress the antibody response if given after exposure of the animal to an antigen. In the rabbit 400 r of whole-body radiation given simultaneously with the antigen (bovine gamma globulin) or as much as 800 r (LD_{50-30}) given 3 days after the antigen have little effect on the serum antibody levels which are maximum about 10 to 12 days after antigen injection. Yet these doses of radiation cause profound damage

in many of the body tissues. Eight hundred r destroys most of the lymphoid tissue and bone marrow leaving only the reticuloendothelial cells and a few obviously injured lymphocytes or hematopoietic cells for 5 to 10 days. Significant histologic recovery takes several weeks. In several rabbits which received 800 r and died of radiation injury relatively normal serum antibody levels were maintained until death. From these observations it appears that the initial phase of the antibody response is dependent on some extremely radiosensitive process, the site of which cannot be determined histologically since it is destroyed by amounts of radiation too small to produce persistent, significant morphologic change. The second phase which involves the actual synthesis of antibody protein is certainly not dependent on any radiosensitive cells or tissues. Whether antibody synthesis in the nonradiated animal takes place in radiosensitive tissues cannot be determined but this does not seem likely. Finally, in reference to the time-honored controversy about antibody production and lymphocytes, it can be said that the only possible role of lymphocytes in antibody production could be in the short initial phase and not in the actual synthesis of antibody. (Entire report)

2953

Stanford Research Inst.

AN EXPERIMENTAL STUDY OF THE DIRECT AND INDIRECT EFFECTS PRODUCED BY X-RAY IRRADIATION AND BY RADIOACTIVE ISOTOPES, WITH SPECIAL REFERENCE TO THE PROTECTIVE ROLE OF THE SPLEEN; FINAL REPORT. Nov. 1, 1952. 23p. (AECU-2491)

Inconclusive results of this study, interrupted before its completion, indicate that the spleen's protective role in the mouse is not confirmed in the rat. (H.F.G.)

2954

Cancer Research Inst., New England Deaconess Hospital, Boston

ENDOCRINE CHANGES AFTER TOTAL BODY IRRADIATION IN PARABIOTIC RATS. Sheldon C. Sommers. [1952]. 18p. (AECU-2493)

A morphologic study was made of endocrine alterations in parabiotic rats during short intervals postirradiation. Aside from the radiosensitive gonadal tissues, few endocrine gland changes were commonly observed, except after prior hemiadrenalectomy. A considerable normal adrenal margin of safety was evident. In protected animals ovarian granulosa cells showed postirradiation hyperplasia. In relatively strained adrenal functional states, radiation produced a decrease of lipid and free carbonyl groups in the adrenal cortex. Increased incidences of hyperplasias of thymus, bone marrow leukocyte precursors and testicular interstitial cells indicated that under maximal experimental strain, irradiation had reduced adrenal cortical functions. Pancreatic islets, ovarian theca cells and thyroid also more often became hyperplastic in postirradiation hypoadrenal conditions. Pituitary cells showed slight direct radiation effects after 1600r. Anterior pituitary functions seemed unaffected or stimulated postirradiation, as shown by tissue responses attributed to gonadotropin, adrenocorticotropin, growth hormone and thyrotropin secretion. Cell counts indicated irregular postirradiation hyperplasias of pituitary basophils and eosinophils. (auth)

2955

Pittsburgh Univ. School of Medicine

A QUANTITATIVE COMPARISON OF THE ANTIBODY PRODUCED BY X-RADIATED AND NORMAL RABBITS. Paul H. Maurer, Frank J. Dixon, and David W. Talmage. [1953]. 10p. (AECU-2498)

The antibody formed by rabbits irradiated with 400 r of whole body x radiation prior to, simultaneously with, or after immunization and by rabbits radiated with 800 r after immunization although often reduced in amount was indistinguishable from that formed by nonradiated rabbits. (auth)

2956

Radiation Lab., Univ. of Calif., Berkeley

MEDICAL AND HEALTH PHYSICS QUARTERLY REPORT [FOR] OCTOBER, NOVEMBER, AND DECEMBER 1952. Feb. 18, 1953. 91p. (UCRL-2111)

Separate abstracts have been prepared on two sections of this report. (C.H.)

2957

Radiation Lab., Univ. of Calif., Berkeley

THE METABOLIC PROPERTIES OF VARIOUS MATERIALS. p.3-75 of MEDICAL AND HEALTH PHYSICS QUARTERLY REPORT [FOR] OCTOBER, NOVEMBER, AND DECEMBER 1952. Feb. 18, 1953. 73p. (UCRL-2111(p.3-75))

The parenteral administration of large amounts of Versene, (ethylenediamine)tetraacetic acid, to rats at the same time Pu was given orally appeared to decrease the skeletal content to a significant degree and also to increase absorption from the site of intramuscular injection. Observations on rats injected with 120 μc of At^{211} indicate a sufficient degree of thyroid damage was produced to cause decrease in growth as well as other indications of diminution of function of thyroid gland. Tissue-distribution data on F administered orally and intravenously to rats are included. Preliminary data are presented on the tissue distribution in rats of intraperitoneally injected therapeutic and tracer doses of K^{42} and K^{43} and resulting hematological changes. Photographs of histologic sections from the thyroid gland of a presumably normal monkey are presented for comparison with those of an untreated monkey thyroid and photographs and radioautographs of an At-treated monkey. Administration of At resulted in a marked but incomplete thyroid destruction. Chemical changes induced by high-energy He ions from the 60-in. cyclotron on acetic acid resulting in the formation of succinic and tricarballylic acids are discussed. Preliminary results on the radiation chemistry of formic acid solutions and glycine are included. (For preceding period see AECD-3448.) (C.H.)

2958

Radiation Lab., Univ. of Calif., Berkeley

BIOLOGICAL STUDIES OF RADIATION EFFECTS AND HEALTH CHEMISTRY AND PHYSICS. p.76-91 of MEDICAL AND HEALTH PHYSICS QUARTERLY REPORT [FOR] OCTOBER, NOVEMBER, AND DECEMBER 1952. Feb. 18, 1953. 16p. (UCRL-2111(p.76-91))

A scanning device is described which employs 10 scintillation counters for mapping the location of γ-emitting isotopes administered as tracers to patients and laboratory animals. Diagrammatic drawings of the instrument and the electronic circuit are included. Problems associated with the handling and storage of high-energy-level isotopes and routine monitoring activities are discussed briefly. (For preceding period see AECD-3448.) (C.H.)

2959

Atomic Energy Project, Univ. of Rochester

COMPARISON OF PATHOLOGIC EFFECTS OF RADIATION IN WEANLING AND ADULT RATS. George W. Casarett. Feb. 17, 1953. 25p. (UR-239)

Presented are histopathologic, hematologic, and clinical data on adult and weanling (4 weeks old) rats subjected to a single total-body dose of 800 r of x rays (250 kv; unfiltered; HVL equivalent to 0.34 mm Cu). Measurements of dose made in air and intraabdominally by means of Victoreen r meters are compared. Weanling rats exhibited a markedly greater degree of acute illness than did adult rats, presented a shock-like picture, and suffered a high mortality between the 3rd and 4th days post-radiation. An explanation for the differences in clinical behavior, physiologic reaction, and

mortality between adult and weanling rats was evident in the form of greater and more rapid histopathologic damage of radiosensitive tissues in weanling rats. The greater cellular damage in weanling rats appeared to be related only in part to greater internal dose measurement, and partly to greater radiosensitivity of the tissues examined. (auth)

2960

Atomic Energy Project, Univ. of Rochester
QUARTERLY TECHNICAL REPORT [FOR] OCTOBER 1, 1952 THRU DECEMBER 31, 1952. Feb. 26, 1953. 41p. (UR-242)

Design is described of a one-piece all-glass centrifuge-type ultrafiltration apparatus which has been found valuable for the study of the clearance of various ions in biological work. Preliminary studies indicate that most of the radiation dose to the lungs from Rn is produced by daughter products removed from the air by the lungs as particulates, rather than by gaseous Rn or the degradation products of the Rn molecules decaying in the lungs. Implications of these results in deciding upon maximum permissible levels from Rn in the air of mines and industrial plants are discussed. A method is described for the preparation of Cr(VI) solutions essentially free of I for use with H_2SO_4 for wet combustion of serum in the protein-bound I determination. A study is reported of variable factors affecting the degree of I^{131} binding in in vitro iodination of rabbit serum proteins. (C.H.)

2961

Naval Radiological Defense Lab.
RADON INHALATION STUDIES IN RATS. S. H. Cohn, R. K. Skow, and J. K. Gong. Nov. 17, [1952]. 17p. (USNRDL-380)

In calculating the relative amount of radiation received by the lungs of animals exposed to a radon atmosphere, the decay products of Rn which would also be present in this atmosphere must be considered of primary importance. The radiation flux received by the respiratory tract from inhaled Rn is considerably less than that from the inhaled decay products RaA, RaB, RaC, and RaC′. This is due to the lungs filtering out dust particles which contain the Rn decay products, and to accumulation of these radioactive substances in the lungs. There is an unequal distribution of the Rn decay products within the lungs, the distribution apparently being a function of the size of the dust particles upon which the daughter decay products are deposited. Following inhalation of a Rn-daughter atmosphere only a small amount of the total γ activity in the respiratory system was found in the trachea and large bronchi. However, the radiation exposure per unit surface area of the bronchi was much greater than for other lung tissue. By instituting measures for the constant removal of dust in mines or by wearing masks that prevent the inhalation of normally present atmospheric dust, the hazard from inhalation of Rn gas can be greatly reduced. It would appear that inhalation studies which consider the radiation from Rn gas alone do not provide a realistic approach to the problem of personnel hazards. (auth)

2962

Naval Radiological Defense Lab.
PHOSPHOLIPID CHANGES IN RAT SKIN AFTER EXPOSURE TO THERMAL ENERGY. W. Lee, A. K. Davis, C. Entenman, and G. E. Sheline. Jan. 29, 1953. 23p. (USNRDL-386)

An investigation of the effects of measured amounts of radiant thermal energy on the phospholipid, acid-soluble phosphorus, and water content of rat skin has been made. The appearance of labeled phospholipid and acid-soluble phosphorus in skin at 6 hr following application of thermal energy and injection of P^{32}-labeled sodium phosphate has been determined. The radiant energy was delivered to the skin in a period of 0.4 sec. The phospholipid and acid-soluble phosphorus contents are not significantly altered in the burned skin. At 3.5 cal/cm^2 and above, the water content of the heat damaged skin is elevated above the normal level. The specific activity of acid-soluble phosphorus increases in burned skin. Phospholipid production appears to fall when 6 cal/cm^2 or more thermal energy are applied. For reasons discussed this critical energy level for interference with phospholipid formation is probably high. (auth)

2963

THE EFFECT ON THE THYROID GLAND AND THE GONADS FOLLOWING CHRONIC TREATMENT OF MICE WITH LOW DOSES OF RADIOIODINE (I^{131}). Roberts Rugh. J. Exptl. Zool. 122, 151-68(1953) Feb.

The pathological effects of weekly injections of graded doses of I^{131} for 6 months on the thyroids and gonads of young mice are described in detail. (C.H.)

2964

EFFECT OF ROENTGEN RAYS ON MICROSPORUM AUDOUINI. AN IN VITRO STUDY Kurt Loewenthal. Arch. Dermatol. and Syphilol. 67, 191-3(1953) Feb.

Two freshly isolated strains of Microsporum audouini, growing on dextrosepeptone agar, received one exposure each of 340 r of unfiltered roentgen rays. Neither the irradiated colonies nor their descendants showed gross and microscopic changes attributable to the irradiation. In experiments previously published, Microsporum canis under similar controlled conditions revealed acceleration and intensification of pleomorphism and degradation of the fuseaux formation. Further studies are required to investigate this apparent difference in sensitivity to a given dose of roentgen rays. (auth)

2965

THE EFFECT OF X RADIATION ON THE RESPIRATION OF ESCHERICHIA COLI. Daniel Billen, G. E. Stapleton, and Alexander Hollaender. J. Bacteriol. 65, 131-5(1953) Feb.

The effect of ionizing radiations, in the form of x rays, on the respiratory system of Escherichia coli has been studied. It was observed that there is an initial period of normal respiration by E. coli, strain B/r, following exposure to an x-ray dose that reduced the number of colony forming cells by more than 99.9%. This period of normal activity is substrate dependent since it was found to be of longer duration on pyruvate and succinate than on glucose A period of normal respiratory activity on glucose, in contrast to an immediate inhibition of oxidative activity on pyruvate, was observed with E. coli (Texas strain). On the basis of the data presented, it is suggested that ionizing radiations may prove to be a useful tool in determining common or divergent pathways in the utilization of two or more substrates by a microorganism. The duration of the normal respiration on glucose shown by exposed cells was relatively little affected by increasing dose (5,000 to 90,000 r). It was found also that the inhibition of the respiratory activity of the exposed cells was more pronounced if respiration was followed at 37°C than if studied at 26°C. If the cells were incubated at 37°C for 60 min before adding substrate, the duration of the normal respiratory period was decreased. (auth)

2966

URINARY EXCRETION OF DESOXYRIBONUCLEASE IN X-RADIATED RATS. O. D. Kowlessar, K. I. Altman, and L. H. Hempelmann. Arch. Biochem. and Biophys. 43, 240-1(1953) March.

A progressive increase in urinary desoxyribonuclease activity up to the fifth day was observed in x-irradiated rats. (C.H.)

2967
POSTIRRADIATION RELEASE OF ADENOSINE TRIPHOSPHATE FROM ESCHERICHIA COLI B/r. D. Billen, B. L. Strehler, G. E. Stapleton, and E. Brigham. Arch. Biochem. and Biophys. 43, 1-10(1953) March.

Data are presented on the effects of x irradiation on adenosine triphosphate metabolism of E. coli. (C.H.)

2968
EFFECT OF X RAYS, CYANIDE, AND VARIOUS RADIATION-PROTECTIVE AGENTS ON THE INFUSORIA. Z. M. Bacq, H. Mugard, and A. Herve. Acta Radiol. 38, 489-505(1952) Dec. (In French)

A close parallelism exists between the resistance to x irradiation and the resistance to cyanide of four species of histophagous infusoria (Ophrioglenidae). The importance of this fact is discussed. Histochemical studies on irradiated infusoria have shown changes only with regard to carbohydrates. The mixture of cysteine and NaCN is found to protect the Ophrioglenidae against the lethal threshold dose of x rays. The other protectors (cysteine alone, cyanide alone, Na pyruvate and β,β-aminoethyl disulfide) have a weaker action and on certain species only. (auth)

2969
SMALL-SCALE ANATOMICAL PECULIARITIES OF THE BACK OF THE HAND IN THEIR SIGNIFICANCE FOR X IRRADIATION OF MALIGN NEOPLASMS IN THIS REGION. Franz Aichinger. Strahlentherapie 89, 257-64(1952). (In German)

In x irradiations of malignant neoplasms in the region of the back of the hand, the particular topography (as regards the minute anatomical forms) of the blood and lymph vessels, of the bones, the tendons, the subcutaneous adipose tissue, and of the skin is responsible for most undesired radioreactions. These reactions are brought about by the development of a chronical indurative edema (Jüngling) wherein the matrix of the tumor is compressed between the edema and the carpal bone. It is thereby deprived of its regenerative possibilities and must necessarily undergo necrosis. The possibilities of avoiding such radiolesions are discussed. (auth)

RADIATION HAZARDS AND PROTECTION

2970
Chalk River Project (Canada)
HAZARD DUE TO BETA RADIATION FROM FISSION PRODUCTS DEPOSITED ON THE GROUND AFTER AN ATOMIC EXPLOSION. F. S. Goulding and G. Cowper. Jan. 1953. 14p. (CREL-529)

A calculation is presented of the contribution of β activity to the total radiation dose deposited on the ground following an atomic explosion. Data are included on β activity associated with γ radiation from atomic explosions. Experimental data from a study of the effect of air absorption and scattering of β rays are applied to a calculation of the β dosage received by an individual in an atomic bomb radiation field. Factors that might affect the dosage received are discussed, and an extreme emergency tolerance dose of 1000 rep of β particles is suggested. Caution is stressed in interpreting the results of radiation surveys when only γ measurements are made. (C.H.)

RADIOGRAPHY

2971
Michigan Univ.
HIGH RESOLUTION DETECTION OF RADIATION; PROGRESS REPORT. Henry J. Gomberg. Jan. 1952. 34p. (AECU-2485)

The new wet-process system of radioautography, reported in the previous report, was studied to provide data for improving resolution and sensitivity. Absolute sensitivity tests made necessary by a simplification and change in the process are reported. The geometrical arrangement of the various components entering into a radioautograph was analyzed to discover the highest resolution limit achievable. A radiation detection system which permits direct location of radioactive sources requiring 100 to 500 diameter magnification is described. Determination of tyrosinase activity in human pigment cells and pigment-cell neoplasms with radioactive tyrosine is discussed. (L.T.W.)

2972
Naval Medical Research Inst., Bethesda
ABSORPTION OF X-RAYS BY TISSUES OF THE HEAD AND NECK. M. G. Wheatcroft and J. E. Morgan. Dec. 16, 1952. 7p. (NM-006-012.04.61)

Relative doses of 200 kvp x rays received by the salivary glands, teeth, and mandible during unilateral and bilateral exposure were measured by the Victoreen condenser r meter. During bilateral x irradiation of salivary glands of dogs the parotids received a larger dose than any other tissue and this was approximately 60% more than the calculated air dose. During bilateral x irradiation of the teeth and mandible, the skin received a larger dose than the other tissues and this was approximately 50% more than the calculated air dose. During bilateral x-ray exposure the total dose to any tissue is the arithmetical sum of the individual doses from each side and this varies according to tissue absorption of x rays. (auth)

RADIOTHERAPY

2973
WORK WITH THE 31-MEV BETATRON. II. THE 31-MEV BETATRON (RADIATION TRANSFORMER) IN THE RADIOTHERAPY CLINIC OF THE ZURICH CANTONAL HOSPITAL. R. Wideröe and H. R. Schinz. Strahlentherapie 89, 321-36 (1952). (In German) (cf. NSA 7-3163)

With the increasing energy of x radiation, the maximum of intensity of the curve representing the depth dose in tissue is shifting towards greater depths, while at the same time the intensity acting on the region of entry is decreasing. The maximum of intensity of the 31-Mev x radiation produced by means of the betatron lies at approximately 6 cm depth of water. The author gives description of the betatron installation for deep-therapy purposes at the Cantonal Hospital in Zurich. (auth)

2974
MEASUREMENT OF THE β ACTIVITY OF IODINE-131 IN CLINICAL USE. Pierre Lerch. Bull. soc. vaudoise sci. nat. 65, 301-9(1952) Nov. 15. (In French)

Methods used by the author in measuring I^{131} in blood, urine, excised tissues, and tissues in vivo are described. (G.Y.)

TOXICOLOGY STUDIES

2975
McCollum-Pratt Inst., Johns Hopkins Univ.
EFFECTS OF EXCESSIVE DIETARY ZINC IN THE RAT AND THE INTER-RELATIONSHIP WITH COPPER. Robert Van Reen. [1952]. 19p. (AECU-2505)

The effects of feeding excessive Zn on liver enzymes of the rat were studied. A dietary level of 500 to 700 mg % Zn resulted in a marked reduction in liver catalase and cytochrome oxidase activities. Cu feeding, along with toxic Zn levels, resulted in an increase of liver catalase and cytochrome oxidase activities to normal values. While Cu supplementation influenced the liver enzymes, it had no effect in correcting the growth inhibition produced by Zn. (auth)

2976
Trudeau Foundation, Saranac Lake, N. Y.
EXPERIMENTAL INVESTIGATIONS CONCERNING

TOXICITY OF BERYLLIUM; PROGRESS REPORT, PART 1. Mar. 15, 1952. 14p. (NYO-4006)

Experiments with three Be compounds revealed that guinea pigs reacted to each of those materials as if they were biologically inert but that rats responded with the development of granuloma-like lesions analagous to lesions of the pulmonary granulomatosis seen in beryllium workers. (auth)

TRACER APPLICATIONS

2977

Cornell Univ. Medical Coll.

EFFECTS OF CORTICOTROPIN AND VARIOUS CONVULSION INDUCING AGENTS ON THE P^{32} CONTENT OF BRAIN PHOSPHOLIPIDS, NUCLEOPROTEINS, AND TOTAL ACID-SOLUBLE PHOSPHORUS COMPOUNDS. Clara Torda. Cornell Univ. Medical Coll. and New York Hospital, New York City. [1951]. 17p. (AECU-2483)

Following the injection of P^{32} to mice, statistically significant changes in the specific activity of the phospholipid fraction of the brain were observed. The sudden and significant decrease of both the specific activity and of the amount of the brain phospholipid fraction observed during convulsions of a few minutes duration indicate that the brain phospholipid fraction is utilized during cerebral activity. Administration of corticotropin induced in less than 15 minutes an increase of both specific activity and the amount of brain phospholipids, indicating an increase in synthesis of brain phospholipids induced by corticotropin. (C.H.)

2978

Iowa State Coll.

THE MECHANISM OF ADENINETHIOMETHYLRIBOSIDE FORMATION. F. Schlenk and Raymond L. Smith. Feb. 1953. 15p. (AECU-2496)

The specific effect of methionine in accumulating adeninethiomethylriboside (5′-thiomethyladenosine) in yeast has been studied with Torulopsis utilis. Experiments with methionine labeled in various positions have shown that the S atom and the methyl group are recovered in the nucleoside. The term "transthiomethylation" is suggested for this reaction. (auth)

2979

St. Louis Univ. School of Medicine

EXCRETION OF THE METABOLITES OF TESTOSTERONE-4-C^{14} IN THE RAT. James Ashmore, William H. Elliott, E. A. Doisy, Jr., and Edward A. Doisy. [1952]. 18p. (AECU-2501)

Testosterone-4-C^{14} has been synthesized by the method of Turner. Following intragastric or intramuscular injection to normal animals, approximately one-third of the administered radioactivity was excreted in the urine and two-thirds in the feces. In animals with cannulated bile ducts, it was found that the bile served as the major route of excretion, while in animals with ligated bile ducts, the kidney served as the major pathway of excretion. Significant amounts of the compounds excreted in the bile were resorbed from the intestinal tract when bile containing radiometabolites was administered to other bile fistula animals. No radioactivity was found in the expired air. Hydrolytic studies indicated that the radiometabolites in the feces were different from those in the bile. (auth)

2980

Chicago Univ.

ON THE SYNTHESIS OF ANTIBODY PROTEIN. H. Green and H. S. Anker. [1952]. 28p. (AECU-2507)

On the basis of the relative isotope concentrations of serum globulin and antibody labeled with C^{14}, N^{15}, and D under different experimental conditions it is concluded that serum globulin cannot be a precursor of serum antibody. It appears that antibody is synthesized de novo from amino acids. When amino acid incorporation is used as a criterion for the time of antibody synthesis it is found that humoral antibody release is not coincident with antibody protein synthesis. At least one-third of the antibody protein was synthesized before any antibody appeared in the circulating blood. (auth)

2981

Cancer Research Inst., New England Deaconess Hospital, Boston

MICROSCOPIC DISTRIBUTION OF RADIOISOTOPES IN TISSUES. Margaret W. Holt and Shields Warren. [1953]. 34p. (AECU-2515)

Autoradiographic techniques were used to demonstrate the distribution of injected P^{32} and S^{35} in mouse or rat ovary, placenta, and intestine. The techniques used were demonstrated to retain water-soluble diffusible substances in situ. P^{32} and S^{35} were shown to be distributed quite differently in these organs, apparently reflecting a difference in chemical metabolism of the two elements. Photographs of the radioautograms are included. (C.H.)

2982

Atomic Energy Project, Univ. of Rochester

POLONIUM INDUCED ANEMIA IN RATS AS STUDIED WITH ALPHA-C^{14}-GLYCINE. R. G. Thomas, K. I. Altman, J. N. Stannard, and K. Salomon. Dec. 9, 1952. 13p. (UR-224)

The effect of intravenously injected Po chloride on hemoglobin synthesis in the rat using α-C^{14}-glycine as a precursor has been investigated. Animals were sacrificed at various times after Po injection in order to study this biochemical response at different stages of the induced anemia. A significant lowering of the millimolar isotope concentration in hemoglobin and of the per cent of the total administered C^{14} dose incorporated into hemoglobin was observed in four groups of rats treated with forty μc of Po. Such a response was not observed in two other groups of rats at the same dosage level and two groups at a lower dosage level. It was found in all cases studied however, that the C^{14}-activity ratio of globin to hemin was not altered appreciably. This occurs also in Be induced anemia but contrasts with results after x irradiation inasmuch as the globin-to-hemin activity ratio using x rays shows appreciable alterations. The implications of these findings are discussed. Hematological data and weight curves are included. (auth)

2983

QUANTITATIVE RELATIONSHIP BETWEEN THYROID FUNCTION AND GROWTH OF PITUITARY TUMORS SECRETING TSH. J. Furth, W. T. Burnett, Jr., and E. L. Gadsden. Cancer Research 13, 298-307(1953) March.

The relation of growth of thyroid stimulating hormone (TSH)-secreting pituitary tumors to thyroid function was studied by destroying or depressing the thyroid gland of mice with graded doses of I^{131}, grafting tumors on such animals, and correlating tumor growth with thyroid function. The results indicate that proliferation of grafted TSH-secreting pituitary tumor cells depends on the secretion of thyroid hormone. Near complete or complete destruction of the thyroid follows administration of a single dose of 200 or more μc of I^{131}. This provides the maximum stimulus to pituitary growth. A lower dose, about 75 μc, produces a lasting depression of the thyroid, some follicles of which, although normal in appearance, are incapable of undergoing fully compensating hyperplasia. In most mice 25 μc interferes little, if at all, with the thyroid function, with ability of this gland to be stimulated by TSH, and with its capacity to inhibit the growth of pituitary tumors. The inverse relation between thyroid function, as indicated by its ability to take up I^{131}, and stimulation of the pituitary tumor grafts is almost quantitative. Cells of thyroid glands

which escaped destruction by large doses of I^{131} do not have the ability to undergo a fully compensating hyperplasia. This may be due in part to the stenosing "radiation arteritis" and diffuse fibrosis in the thyroid region caused by I^{131}. Radiothyroidectomy causes an increased total-body retention of I^{131} during the first 24 hr following injection. Pituitary tumor grafts secreting TSH further enhance total-body retention of I^{131}. The sites of this I^{131} are not precisely known. In radiothyroidectomized mice (with and without tumor) the elimination of the retained I^{131} is rapid. In normal mice bearing grafted tumors most of the retained radioiodine is in the thyroid, and its retention is lasting. (auth)

2984

MEASUREMENT OF TURNOVER RATES IN SYSTEMS OF HYDRODYNAMIC POOLS OUT OF DYNAMIC EQUILIBRIUM. Louis C. Lax and Gerald A. Wrenshall. Nucleonics 11, No. 4, 18-20(1953) Apr.

A method similar to one proposed by Zilversmit and Shore (Nucleonics 10, No. 10, 32(1952)) is described whereby a hydrodynamic "model" is applied as an aid in the measurement of turnover rates in tracer studies. The experiment is preparatory to the study of turnover rates in living organisms. With the methods described, dynamic equilibrium need not be assumed nor velocity functions used. (L.M.T.)

2985

SIZE OF DOSE: ITS EFFECT ON DISTRIBUTION IN THE BODY. Herbert E. Stokinger. Nucleonics 11, No. 4, 24-7(1953) Apr.

Often substantial quantitative, and at times qualitative, differences in distribution and excretion of an element in the body follow upon the administration of different dosage levels. With certain elements these differences can be so great as to result in erroneous conclusions as to the tendency of an element to accumulate in certain organ sites. Current physicochemical theory and experimental results thus far available are used to furnish a reasonable explanation as to why certain of these differences in distribution with dose occur. This review develops the fact that there are at least three distinct mechanisms that regulate the distribution of an element in the body. 16 references. (auth)

CHEMISTRY

2986

Radiation Lab., Univ. of Calif., Berkeley

AN ION EXCHANGE STUDY OF POSSIBLE HYBRIDIZED 5f BONDING IN THE ACTINIDES. R. M. Diamond, K. Street, Jr., and G. T. Seaborg. Aug. 28, 1951. Decl. with deletions Mar. 6, 1953. 52p. (AECD-3517; UCRL-1434 (rev.))

A study has been made of the elution behavior of Cu(III), Am(III), Pu(III), Ac(III), Pu(IV), Np(IV), U(IV), Th(IV), Np(V), Pu(VI), U(VI), La(III), Ce(III), Eu(III), Yb(III), Y(III), Sr(II), Ba(II), Ra(II), Cs(I) with 3.2M, 6.2M, 9.3M, and 12.2M HCl solutions from Dowex-50 cation-exchange resin columns. These elutions show that in high concentrations of hydrochloric acid the actinides form complex ions with chloride ion to a much greater extent than the lanthanides. The strengths of the tripositive actinide complex ions apparently go in the order Pu > Am > Cm, although their ionic radii also decrease in this same order. To explain these results, a partial covalent character may be ascribed to the bonding in the transuranium complex ions. It is shown that a reasonable structure for such covalent bonding involves hybridization of the 5f orbitals in the actinide elements. (auth)

2987

[Illinois Univ.]

THE EFFECT OF PRESSURE ON DIFFUSION IN CS_2-ORGANIC MIXTURES. R. C. Koeller and H. G. Drickamer. [1952]. 25p. (AECU-2464)

Diffusion coefficients are presented as a function of pressure to 10,000 atm. for the systems 50% chlorobenzene–50% CS_2, 20–40°; 80% chlorobenzene–20% CS_2, 40°; 50% n-butanol–50% CS_2, 20–40°; and 50% iso-butanol–50% CS_2, 20–40°, using S^{35} tagged CS_2. The results are discussed in terms of the activation volume, entropy, and enthalpy, and of the effect of pressure on liquid structure. A discontinuity in the diffusion coefficient is noted for the chlorobenzene systems in the range 2000 to 3000 atm. In general, there is evidence of more effect of pressure on the structure in these systems than for the organic systems previously discussed. (auth)

2988

Illinois Univ.

THE EFFECT OF PRESSURE ON DIFFUSION IN AQUEOUS AND ALCOHOLIC SALT SOLUTIONS. R. B. Cuddeback and H. G. Drickamer. [1952]. 25p. (AECU-2465)

Diffusion coefficients were measured as a function of pressure to 10,000 atm. in 0.1N aqueous solutions of $Hg(NO_3)_2$ at 0, 25, 50, and 75°C; $CaCl_2$ at 25 and 50°C; $Ca(NO_3)_2$ at 25°C; and $TlNO_3$ at 25°C. Measurements were also made in a 0.01M $HgCl_2$ in n-butanol solution. (auth)

2989

Illinois Univ.

THE EFFECT OF PRESSURE ON DIFFUSION IN WATER AND IN 0.1 N H_2SO_4. R. C. Koeller, R. B. Cuddeback, and H. G. Drickamer. [1952]. 21p. (AECU-2470)

Diffusion coefficients are presented as a function of pressure to 10,000 atm. for the following systems: $THO-H_2O$, 0–25–50°; and 0.1N $H_2S^{35}O_4$–0.1N H_2SO_4, 0–5–25–50°. The results are interpreted in terms of the activation volume and the tetrahedrally coordinated structure of H_2O. It is found that pressure tends to break down the structure and in certain regions an increase in diffusion coefficient with pressure is noted. (auth)

2990

Northwestern Univ.

MECHANISM OF SUBSTITUTION REACTIONS IN COMPLEX IONS. 4. KINETICS OF THE REACTIONS OF CIS AND TRANS-CHLORONITRO-BIS(ETHYLENEDIAMINE)COBALT(III) AND AQUONITRO-BIS(ETHYLENEDIAMINE)COBALT(III) IONS WITH VARIOUS REAGENTS IN AQUEOUS SOLUTIONS. Fred Basolo, Bobbie D. Stone, John G. Bergmann, and Ralph G. Pearson. [1953]. 17p. (AECU-2476)

The results of a kinetic study of the reactions of cis- and trans-chloronitro-bis(ethylenediamine)cobalt(III) and aquonitro-bis(ethylenediamine)cobalt(III) ions with nitrate, thiocyanate, and azide ions in aqueous solutions are reported. The reaction of the chloronitro complex with either nitrate ion or thiocyanate ion was found to take place by a 2-step process. The same limiting rate was reached in the reaction of the aquonitro complex with either nitrate ion or azide ion. The results have been interpreted on the basis of a dissociation mechanism with a tetragonal pyramid intermediate. (auth)

2991

Los Alamos Scientific Lab.

THE REGULAR PRODUCTION OF 85 PER CENT PARA LIQUID HYDROGEN. E. R. Grilly. Feb. 5, 1953. 6p. (AECU-2482; LADC-1362)

The storage of liquid H has become much less trouble-

some as a result of regularly producing 85% para liquid instead of normal. An ordinary liquefaction plant was modified so that the ortho-to-para conversion is catalyzed in the feed gas (at 76°K) and in the liquid within the liquefier. The liquid-phase conversion causes the full liquefaction rate to drop from 25 to 20.5 liter/h. Data were also obtained for other liquefaction rates, with and without feed-gas catalysis. (auth)

2992

Los Alamos Scientific Lab.

PREPARATION OF A STANDARD SAMPLE OF C^{14} LABELED BENZOIC ACID FOR EFFICIENCY DETERMINATIONS IN SCINTILLATION COUNTING. D. L. Williams and A. R. Ronzio. [1953]. 7p. (AECU-2486; LADC-1385)

Since C^{14} carbon dioxide is not counted very satisfactorily, an organic compound which is soluble in toluene and is easily prepared from CO_2 is desirable for efficiency determinations in scintillation counting. A method is described whereby C^{14} benzoic acid is prepared for this purpose. Carbon dioxide was generated, in vacuum, from C^{14} barium carbonate (~6%) and converted to C^{14} benzoic acid via the Grignard reaction. To guard against dilution of the C^{14} carbon dioxide, a new apparatus was designed which permitted the preparation of the Grignard reagent, phenyl MgBr, on a 5 to 10 millimole scale. (L.M.T.)

2993

Argonne National Lab.

THE SYSTEM COBALTOUS CHLORIDE-WATER-TERTIARY BUTYL ALCOHOL AT 25° C. Leonard I. Katzin and John R. Ferraro. Mar. 1953. 9p. (AECU-2509; UAC-738)

The system cobaltous chloride-water-t-butyl alcohol at 25°C shows as equilibrium solids the generally accepted hydrates (hexa-, di- and monohydrate), and in addition a tetrahydrate-dialcoholate. The anhydrous equilibrium solid is probably $CoCl_2$. Concentrations of cobaltous chloride as high as 9 mole % over the monohydrate may be compared with 7 mole % for the saturated aqueous solution. A region of two liquid phases in equilibrium is found. (auth)

2994

Atomic Energy Research Establishment, Harwell, Berks (England)

DEHYDRATION OF LOW VALENCY INORGANIC HALIDES. E. R. Harrison. July 26, 1952. 13p. (AERE-G/R-929)

A method is described for dehydrating the majority of the low-valency metal halides such that they are 100% volatile in vacuo and suitable for use as source materials in the electromagnetic isotope separator. (auth)

2995

Atomic Energy Research Establishment, Harwell, Berks (England)

THE INHIBITION OF GAS PHASE REACTIONS OF ZIRCONIUM BY ANODIC OXIDE FILMS. PART 1. J. J. Polling and A. Charlesby. Nov. 13, 1952. 18p. (AERE-M/R-1040)

The effect of temperature on the growth and structural stability of thin oxide layers of Zr has been studied. These oxide layers, formed at room temperature by anodizing the metal in suitable electrolytes, grow, when subsequently heated, to some limiting thickness, depending on the temperature. Thick films (several thousand angstroms) appear to be stable up to 300°C. Non-anodized specimens also grow a film on heating, but this appears to change its character after prolonged heating. The thicker anodic films offer good protection against the absorption of atmospheric gases by the metal itself, at least up to 300°C, the highest temperature used so far in these experiments. Thinner anodic films, or oxide films formed by heating in air, are not protective in this way, and dissolution of gases or their reaction products in the metal occurs according to a quadratic law $(\Delta m)^2 = C^2t$, where m = increase in weight of specimen, t = time at temperature, and C = constant. (auth)

2996

Battelle Memorial Inst.

APPARATUS FOR DETERMINING THE SETTLING RATES OF SLURRIES. C. V. Weaver, E. M. Simons, J. N. Pattison, and J. H. Stang. Feb. 3, 1953. 14p. (BMI-806)

An automatic, recording balance for measuring sedimentation rates and, indirectly, particle-size distributions in slurries is described. Its chief advantage over conventional equipment of this type lies in the novel method of making the system automatic. Room-temperature tests on slurries of silica flour in water show that the system has a sensitivity of two milligrams and a high degree of stability. Results are reproducible and agree closely with data obtained from an air Infrasizer. With proper precautions against convection and evaporation, it should be possible to use this balance to study slurries at elevated temperatures. (auth)

2997

Syracuse Univ.

PHOTOCHEMICAL REACTIONS OF COMPLEX MOLECULES IN CONDENSED PHASE. Henry Linschitz. Nov. 1, 1952. 30p. (NYO-656)

Studies were made on light-initiated electron-transfer processes in glassy solutions at low temperatures and the kinetics of chemiluminescent reactions involving porphyrin dyes and organic peroxides. The reversible photochemical reaction between chlorophyll and quinone in rigid solvents is greatly slowed down by removal of the Mg atom from the pigment. Chlorophyll in a rigid hydrocarbon glass does not exhibit reversible bleaching upon cross-illumination, whereas in a glass containing ether and ethanol marked bleaching effects are observed. Allomerization also acts to abolish the chlorophyll-quinone reaction. A new dark reaction between chlorophyll and quinone was found. The kinetics of the chemiluminescent reaction between dyes and organic peroxides were studied, particularly for the system Zn tetra-phenyl porphine–tetralin hydroperoxide, in tert-butylbenzene. Several other peroxides were tested for relative efficiency as luminescent agents. Further studies were made on the symmetric photoreduction and photooxidation process, in which the same semiquinone is formed by the illumination of either the oxidized or reduced form of an organic redox couple. (L.T.W.)

2998

Pittsburgh Univ.

STUDIES OF NaCl-KCl SOLID SOLUTIONS. 1. HEATS OF FORMATION, LATTICE SPACINGS, DENSITIES, SCHOTTKY DEFECTS AND MUTUAL SOLUBILITIES: [PROGRESS REPORT]. W. T. Barrett and W. E. Wallace. Apr. 7, 1953. 15p. (NYO-952)

Heats of formation, lattice spacings and densities of a series of NaCl-KCl solid solutions homogenized at 630°C and quenched to room temperature are presented. Results of a redetermination of the solid state unmixing curve are also given. Data are included showing the number of Schottky defects in this system. (auth)

2999

Canisius Coll.

GAS PRODUCTION IN THE PHOTOLYSIS OF LIQUID METHYL IODIDE. Robert H. Schuler and Chester T. Chmiel. Feb. 1953. 28p. (NYO-3263)

Methane and ethane are observed in the photolysis, at 2537 A, of liquid methyl iodide. The quantum yields are determined to be, respectively, 0.023 and 0.007 and are independent of the extent of irradiation, the temperature of irradiation, and the presence of small amounts of iodine. Little or no hydrogen, ethylene, or acetylene formation is observed. (auth)

3000
New York Univ.
THE SOLUBILITY OF LEAD CHLORIDE IN SODIUM CHLORIDE, PERCHLORIC ACID, AND HYDROCHLORIC ACID SOLUTIONS. S. Z. Lewin, John E. Vance, and Lawrence B. Nelson. Feb. 5, 1953. 7p. (NYO-3516)

The solubility of $PbCl_2$ at 25°C in various molal concentrations of NaCl, HCl, and $HClO_4$ was measured. The results are tabulated. It is concluded that no double salts are formed between NaCl and $PbCl_2$ for solutions up to 4 molal in NaCl. (J.S.R.)

3001
Radiation Lab., Univ. of Calif., Berkeley
EMPIRICAL CONSIDERATIONS OF ENTROPY. 3. A STRUCTURAL APPROACH TO THE ENTROPIES OF AQUEOUS ORGANIC SOLUTES AND COMPLEX IONS. James W. Cobble. Feb. 3, 1953. 24p. (UCRL-2105)

A method for estimating the entropy of complex aqueous organic solutes and related species has been developed by a structural extension of a method of Powell and Latimer for simple solutes. The agreement between calculated and observed values is good, in general, although systematic deviations begin to occur for very complicated and large solutes. The method is extended to the calculation of the entropies of charged organo-metallic complex ions with good success, and possible applications to systems of biological interest are indicated. Subsequent to the development of the general method for estimating the entropies of aqueous solutes, an empirical equation is also given for calculating gaseous entropies of both inorganic (ionic) and organic molecules from their structures. (auth)

3002
Atomic Energy Project, Univ. of Rochester
THE STABILITY OF COMPLEXES BETWEEN CALCIUM AND ORTHOPHOSPHATE, POLYMERIC PHOSPHATE, AND PHYTATE. R. E. Gosselin and E. R. Coghlan. Jan. 22, 1953. 17p. (UR-236)

Complexes between Ca and seven phosphate ligands have been evaluated in terms of their stabilities in 0.15M NaCl (pH 7.4, 37°C). In competing with a Na resin for ionic radiocalcium, the ligands were equally effective when present in the following relative concentrations of total P: tripolyphosphate 1.0, pyrophosphate 4.7, phytate 4.8, tetrametaphosphate 12, trimetaphosphate 65, and orthophosphate 112. All complexes were of the 1:1 type except hexametaphosphate, where two units of ligand were associated with each Ca in a highly stable complex. The pK_c of $CaHPO_4$ ($= Ca^{++} + HPO_4^{-2}$) was estimated to be 1.86. The relatively high stability of the Ca-phytate complex (and of the uranyl-phytate complex) suggests that pure phytate possesses a P–O–P linkage and is therefore polymerized. (auth)

3003
COMPLEXES OF THORIUM WITH ALKALI METAL PHTHALATES, MALONATES, SUCCINATES, AND MALEATES; CONSTITUTIONS AND PROPERTIES. Bobtelsky and I. Bar-Gadda. Bull. soc. chim. France, 382-6(1953) Apr. (In French)

Heterometric titrations gave the following results: In aqueous solution, Th forms both soluble and insoluble complexes with the same empirical composition. Phthalate gives the complexes $[ThPht]^{++}$, $[Th_2Pht_3]^{++}$, $[ThPht_2]^0$, $[ThPht_3]^{--}$, and $[ThPht_4]^{-4}$. Maleate forms only the complex anion $[ThMale_3]^{--}$, from which $Th[ThMale_3]_2$ and $Na_2[ThMale_3]$, insoluble in alcohol, are obtained. In addition the intermediates $[ThMale_3]^{++}$ and probably $[ThMale]^{+n}$ exist. With succinate, insoluble $[ThSucc]^{++}$ and $ThSucc_2$ are obtained; no complex anions are found. By conductometry, malonate gives the complexes $[ThMalon]^{++}$ and $[ThMalon_3]^{--}$ (tr-auth)

3004
FINAL WORD OF MY REPLY TO THE WORK OF E. HAYEK, TH. REHNER, AND A. FRANK: HALOGENIDES OF DI- AND TRIVALENT THORIUM. Peter W. Schenk. Monatsh. 84, 205-7(1953) Feb. 15. (In German; cf. NSA 7-71, 7-777)

The position of Th, Pa, and U in the periodic system is discussed further. (G.Y.)

AEROSOLS

3005
Chemical Defence Experimental Establishment, Porton Wilts (England)
THE EFFECT OF THE ELECTRIC CHARGE DISTRIBUTION ON THE AGEING OF AN AEROSOL. T. Gillespie. June 26, 1952. 26p. (PTP-289)

Smoke chamber experiments have been carried out to determine the electric charge distributions and the constants descriptive of coagulation and surface loss of an aerosol. The data obtained were used to test the hypothesis that the rate of coagulation is affected by the electric charge distribution. Rough calculations have been made of the effect of electric charges on the particles of an aerosol on its rate of coagulation due to Brownian movement, differences in gravitational settling, and turbulence. For aerosols having symmetrical charge distributions the rate of coagulation appears to depend on the fraction of the particles charged and the ratio of the square of the average charge of one sign present to the average radius. A more exact treatment of aging data than has previously been presented indicates a possible variation in the rates of coagulation and surface loss with time, and these variations appear to be described by theory. (auth)

ANALYTICAL PROCEDURES

3006
St. Louis Univ. School of Medicine
HYDROLYSIS OF CONJUGATES OF URINARY CORTICOIDS WITH β-GLUCURONIDASE. 2. THE ISOLATION AND DETERMINATION OF TETRAHYDROCORTISONE. Billy Baggett, Ralph A. Kinsella, Jr., and Edward A. Doisy. [1952]. 26p. (AECU-2502)

Utilizing the paper chromatographic method tetrahydrocortisone has been found to be the principal α-ketolic steroid extractable from human urine after hydrolysis with bacterial β-glucuronidase. The compound was identified by isolation in crystalline form and characterization. The daily excretion of this compound by the group of normal individuals studied was 2.0 to 7.4 mg. The excretion of tetrahydrocortisone was markedly increased by the administration of adrenocorticotrophin and Kendall's compounds E and F. (auth)

3007
Ames Lab.
SPECTROPHOTOMETRIC DETERMINATION OF THORIUM IN BLACK SANDS. Charles V. Banks, Donn W. Klingman, and Carol M. Byrd. Dec. 1, 1952. 7p. (ISC-296)

A simple and rapid method for the spectrophotometric determination of Th in black sands is described. The sample is ground and mixed, fused, digested, centrifuged, washed with HF, extracted with mesityl oxide, and analyzed spectrophotometrically. (L.T.W.)

3008
North American Aviation, Inc.
DETERMINATION OF IRON IN THORIUM METAL AND IN THORIUM COMPOUNDS BY A HYDROCHLORIC ACID METHOD. L. Silverman and K. Trego. Feb. 18, 1953. 15p. (NAA-SR-224)

Spectrophotometric curves of $FeCl_3$, $ThCl_4$, and the metal chlorides of elements which might be expected to be

found in Th metal or in purified Th compounds have been examined; 0.02 mg (0.002%) Fe may be detected in 1 g of Th sample. No preliminary separations are involved in this procedure. The noninterference of expected impurities was noted. (auth)

3009

Tour, Sam, and Co., Inc.

RESEARCH AND DEVELOPMENT OF METHODS OF CHEMICAL ANALYSIS FOR TITANIUM METAL AND ALLOYS; FINAL TECHNICAL REPORT. Henry Suss, Gregory Pantchenko, Anna Aronson, and Doris C. Sutton. Mar. 2, 1953. 148p. (NP-4503; WAL-401/48/A-21)

Development, evaluation, and compilation of methods of chemical determination of 29 elements in Ti and Ti alloys is presented. (J.E.D.)

3010

Pittsburgh Univ.

2-(o-HYDROXYPHENYL)-BENZOXAZOLE AS A VOLUMETRIC REAGENT FOR CADMIUM. Joseph L. Walter and Henry Freiser. July 2, 1952. 5p. (NYO-3068)

The steps involved in the volumetric determination of Cd include Cd precipitation as the chelate, dissolution of the Cd chelate in glacial acetic acid, and bromination of the dissociated chelate, from which the per cent Cd can be easily calculated. An accuracy of ±0.2 mg of Cd can be obtained by this procedure. (L.T.W.)

3011

A NEW METHOD FOR THE DETERMINATION OF THE FLUORESCING INTENSITY OF URANIUM TRACES. P. Savic and I. Draganic. Bull. acad. serbe sci., Classe sci. math. et nat., sci. nat. (N.S.) 4, 149-50(1952). (In English)

Measurement of the fluorescence of U traces fused with NaF can be done by exposing standards and samples to photographic film for decreasing intervals of time. (J.S.R.)

3012

THE SCOPE OF RADIOACTIVATION ANALYSIS. A. A. Smales. Atomics 4, 55-63 and 74(1953) March.

The advantages of radioactivation techniques over conventional methods of chemical analysis where very small quantities are involved are discussed. The scope, theory, practice, limitations, and applications of the technique are reviewed. (C.H.)

ATOMIC WEIGHTS AND PERIODIC SYSTEMS

3013

THEORY OF THE PERIODIC SYSTEM OF ELEMENTS. D. Ivanenko and S. Larin. Doklady Akad. Nauk S.S.S.R. 88, 45-8(1953) Jan. 1. (In Russian)

The usual Thomas-Fermi statistical method for predicting configurations of electrons shells fails in some cases, for example, the prediction of the appearance of f electrons at Cs (Z = 55) rather that at Ce (Z = 58). An attempt is made to improve the theory by making use of the Thomas-Fermi-Dirac approach, taking exchange effects into account. (G.Y.)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

3014

Radiation Lab., Univ. of Calif., Berkeley

THE CRYSTAL STRUCTURE OF HIGH CYCLOBUTANE. Giles F. Carter and D. H. Templeton. Mar. 3, 1953. 4p. (UCRL-2130)

The structures of the 2 solid forms of cyclobutane were investigated by x-ray diffraction. Slow freezing resulted in single crystals of the high form whose orientations seemed to be random. Rotation photographs of 4 crystals at ~173°K (axes of rotation ~[100], [311], [531], and [441], respectively) show the unit cell to be b.c.c., with $a = 6.06 \pm 0.03$ A. The unit cell, with 2 molecules, corresponds to a calculated density of 0.84 ± 0.01 g/cm^3. Structure factors were calculated on the basis of complete spherical symmetry, no correction being made for temperature or absorption. (L.T.W.)

DEUTERIUM AND DEUTERIUM COMPOUNDS

3015

MOLECULAR VIBRATION SPECTRA OF NAPTHALENE AND ITS DERIVATIVES. I. PREPARATION OF DEUTERATED NAPHTHALENES AND THEIR RAMAN SPECTRA. Josef Goubeau, Horst Luther, Klaus Feldmann, and Günter Brandes. Chem. Ber. 86, 214-26(1953). (In German).

Octadeuteronaphthalene was prepared by pyrogenic condensation of deuteroacetylene, and partially deuterated naphthalene derivatives were prepared by substitution of the H atoms with deuterated Grignard reagents. Raman spectra of naphthalene and 1-deutero-, 2-deutero-, octadeutero-, 1-methyl-4-deutero-, 1-ethyl-4-deutero-, 2-methyl-1-deutero-, 2-ethyl-1-deutero-, and 2-monodeuteromethylnaphthalene are presented. (G.Y.)

3016

THE POLYMERIZATION OF ALLYL COMPOUNDS. VI. THE POLYMERIZATION OF ALLYL-1-d_2 ACETATE AND THE MECHANISM OF ITS CHAIN TERMINATION. Paul D. Bartlett and Fred A. Tate. J. Am. Chem. Soc. 75, 91-5(1953) Jan. 5.

Allyl acetate having deuterium at the α-position of the allyl group was polymerized by benzoyl peroxide in amounts from 0.25 to 2.00% by weight. The rates of polymerization were from 1.93 to 2.89 times those observed in identical experiments with undeuterated allyl acetate, and the average molecular weight of all the polymer so produced was 2.38 times as great for the deuterated as for the undeuterated material. These results confirm the conclusion previously reached on kinetic grounds that the chain-terminating step in the polymerization of allyl acetate involves the transfer of hydrogen from the α-position of allyl acetate to a chain-carrying free radical. Assuming that all chains are terminated in this way, light hydrogen is estimated to be transferred in this atomic displacement reaction about three times as fast as deuterium. Chain transfer in the polymerization of allyl acetate must also proceed through the α-acetoxyallyl free radical. (auth)

3017

X-RAY-CRYSTALLOGRAPHIC STUDY OF THE ABSORPTION OF DEUTERIUM BY LANTHANUM. Bertrand Dreyfus-Alain. Compt. rend. 236, 1265-6(1953) Mar. 23. (In French)

Investigations on modifications in the La lattice during H_2 fixation (NSA 6-6573 and 7-1088) have been extended to D_2. No absorption of D_2 by La was noted until the temperature was raised to 250°C, the velocity of absorption then being much slower than that of H_2. After the reaction, the initial f.c.c. lattice with $a = 5.29$ A completely disappeared, and a single f.c.c. structure appeared with $a = 5.67_6$. No variation in this parameter was observed when the preparation was maintained under vacuum at temperatures between 20 and 300°C, a result quite different from that found with the hydride. No apparent change was observed in the preparation even after 45 days in the presence of D_2 in the cold. A final heating at 300°C, however, caused a new absorption and a change in the lattice parameter from $a = 5.67_6$ to 5.69_1 A. An induction effect, causing the results to be dependent on the history of the samples and, in some cases, unreproducible, is indicated. (G.Y.)

3018

USE OF HEAVY WATER AS SOLVENT FOR SPECTROSCOPIC INVESTIGATION IN NEAR INFRARED. V. B. Evstigneev. Doklady Akad. Nauk S.S.S.R. 89, 105-8(1953) Mar. 1. (In Russian)

The high transparency of D_2O relative to H_2O in the wave-

length region 1.1 to 2 μ makes possible infrared absorption spectroscopy of numerous compounds. Absorption tracings of H_2O, mannite, saccharose, urea, cysteine, glutamine, NH_4Cl, hydroxylamine, aniline, and KCl, each dissolved in D_2O, are illustrated. Absorption spectra of pyridine in acetone, CCl_4, and D_2O and of phenol in CCl_4 and D_2O are intercompared as to solvent effect. (G.Y.)

3019

INFRARED SPECTRA OF HEAVY WATER ADSORBED ON SILICA GEL. George C. Pimentel, Carl W. Garland, and George Jura. J. Am. Chem. Soc. 75, 803-5(1953) Feb. 20.

A technique has been developed for the determination of the infrared absorption spectrum of adsorbed D_2O. The experiments were performed with D_2O adsorbed on silica gel. In the 1900 to 3400 cm^{-1} region, the spectra of samples with surface coverages from 0.35 to 1.8 monolayers are similar to the spectrum of D_2O in the liquid phase. Exchange of the adsorbed D_2O with the H_2O in the gel has been observed. (auth)

FLUORINE AND FLUORINE COMPOUNDS

3020

FLUORINATED ESTERS. I. ESTERS OF PERFLURO MONOCARBOXYLIC AND DICARBOXYLIC ACIDS WITH 1,1-DIHYDROPERFLUOROALCOHOLS AND $\alpha,\alpha,\omega,\omega$-TETRAHYDROPERFLUOROGLYCOLS. Murray Hauptschein, Joseph F. O'Brien, Charles S. Stokes, and Robert Filler. J. Am. Chem. Soc. 75, 87-9(1953) Jan. 5.

A general method for the synthesis of the almost completely fluorinated esters and diesters of 1,1-dihydroperfluoro alcohols and $\alpha,\alpha,\omega,\omega$-tetrahydroperfluoro glycols with perfluoro mono- and dicarboxylic acids, by the action of perfluoro acid chlorides and anhydrides on the fluorinated alcohols and diols, is described. Several physical and chemical properties of these new compounds, as well as of certain intermediates, are given. (auth)

3021

QUANTUM THEORY OF THE HYDROFLUORIC ACID MOLECULE. Daniel Kastler. Compt. rend. 236, 1271-3 (1953) Mar. 23. (In French)

Bond energies, dipole moments, and wave functions for the HF molecule have been calculated by considering six molecular states and taking account of all the electrons. (G.Y.)

3022

THE BASE STRENGTHS OF AROMATIC HYDROCARBONS RELATIVE TO HYDROFLUORIC ACID IN ANHYDROUS HYDROFLUORIC ACID AS THE SOLVENT. Martin Kilpatrick and Fred E. Luborsky. J. Am. Chem. Soc. 75, 577-84(1953) Feb. 5.

Apparatus for the preparation of HF of high purity is described. The conductances of KF and of the methyl-substituted benzenes, including benzene, have been measured in this acid at several concentrations at 20.0°C. The conductances of these same solutions were also measured in the presence of BF_3 up to a pressure of 100 psi. It has been shown that the principal equilibrium existing in solutions of methylbenzenes in HF is $Ar + HF \rightleftharpoons ArH^+ + F^-$. The stoichiometric equilibrium constant for this reaction calculated from the conductance data ranged from 10^{-8} for benzene to 10^{-2} for hexamethylbenzene. This order of the basic strengths of the methylbenzenes relative to HF is substantially in agreement with the results of previous workers arrived at by other techniques. The present results indicate that the BF_3 reacts only with the fluoride ion. Isomerization of the tetramethylbenzenes, but not the xylenes or trimethylbenzenes in anhydrous HF is reported, and the role of HF-BF_3 mixtures as catalysts in organic reactions is discussed briefly. The results indicate the ArH^+ cation can be quite stable and is an important intermediate in these systems. (auth)

3023

THE DETERMINATION OF THE SURFACE TENSION AND VISCOSITY OF LIQUID CHLORINE TRIFLUORIDE. A. A. Banks, A. Davies, and A. J. Rudge. J. Chem. Soc., 732-5 (1953) Mar.

The surface tension of liquid ClF_3 has been determined by the method of capillary rise over the temperature range 0 to 50°C. The results are expressed by the equation $\gamma_t = 26.7 - 0.16t \pm 0.2$ dyne/cm. The parachor for ClF_3 is 111.5. The viscosity of ClF_3 has been measured over the temperature range 18 to 50°C, the value at 20°C being 4.35 mp. (auth)

3024

ACIDITY AND INFRARED ABSORPTION OF FLUORINATED ALCOHOLS. Albert L. Henne and William C. Francis. J. Am. Chem. Soc. 75, 991-2(1953) Feb. 20.

Ionization constants and infrared absorption spectra of $C_3F_7CH_2OH$, $C_3F_7CH(OH)C_3H_7$, and $C_3F_7CH(OH)C_3F_7$, were determined; the data are analyzed in relation to structure and F substitution. (G.Y.)

3025

SOME REACTIONS OF FLUOROETHANES WITH SODIUM ETHOXIDE. Paul Tarrant and John A. Young. J. Am. Chem. Soc. 75, 932-4(1953) Feb. 20.

Evidence is offered that the formation of fluoroethers by the reaction of a saturated fluorohalo compound with Na ethoxide is not due to a simple displacement reaction of the Williamson type in most instances. The products formed in a number of reactions can be accounted for only by assuming that the saturated compounds are converted to fluoroölefins which then add alcohol to give the fluoroether. (auth)

3026

FLUORINATED ESTERS. II. DIESTERS OF PERFLUOROCARBOXYLIC ACIDS WITH ALCOHOLS AND GLYCOLS. Robert Filler, Joseph F. O'Brien, Jack V. Fenner, and Murray Hauptschein. J. Am. Chem. Soc. 75, 966-8(1953) Feb. 20.

A series of diesters of perfluorofatty acids has been prepared by condensation of fluorocarbon acids and acid chlorides with α,ω-polymethylene glycols and by the reaction of the silver salts of these acids with α,ω-polymethylene diiodides. A number of new diesters and polyesters of perfluorodicarboxylic acids with unfluorinated alcohols and diols are described. Various physical and chemical properties of these compounds and of certain intermediates are given. (auth)

3027

THE SYNTHESIS AND POLYMERIZATION OF SOME FLUORINATED STYRENES. Maurice Prober. J. Am. Chem. Soc. 75, 968-73(1953) Feb. 20.

A series of fluorinated styrenes, α,β,β-trifluorostyrene, β,β-difluorostyrene, α,β-difluorostyrene and α-chloro-β-fluorostyrene was prepared starting with Na difluoroacetate. α,β,β-Trifluorostyrene was also prepared by the direct reaction of chlorotrifluoroethylene and benzene. Good conversion to a high-softening polymer was obtained with α,β,β-trifluorostyrene. (auth)

LABORATORIES AND EQUIPMENT

3028

McCollum-Pratt Inst., Johns Hopkins Univ.

A HIGH EFFICIENCY STILL FOR PURE WATER. Robert Ballentine. [1949]. 13p. (AECU-2503)

A semiautomatic still for the production of high-purity distilled water is described. It is characterized by high power efficiency, compactness, and a high rate of product output. The purification factor from metals (represented by Co) is 10^8. (auth)

RADIATION CHEMISTRY

3029

Canisius Coll.

THE RADIOLYSIS OF LIQUID METHYL IODIDE. Robert C. Petry and Robert H. Schuler. Feb. 1953. 40p. (NYO-3264)

Hydrogen, methane, ethane, ethylene, acetylene, C_3 and C_4 hydrocarbons, methylene iodide, and ethyl iodide have been observed as products in the radiolysis of liquid methyl iodide. The yields are directly proportional the the total irradiation of the sample and independent of the presence of small amounts of free iodine. The relative yields for irradiation with Co^{60} γ radiation are identical to those for irradiation with x radiation and the absolute yields are in approximate agreement. The relatively high yield of ethane, together with other complications evidenced by the formation of minor products, indicates the importance of ionic processes in the over-all decomposition. (auth)

3030

Radiation Lab., Univ. of Calif., Berkeley

OBSERVATIONS ON THE RADIATION DECOMPOSITION OF SOME C^{14}-LABELED COMPOUNDS. B. M. Tolbert, P. T. Adams, Edward L. Bennett, Ann M. Hughes, Martha R. Kirk, R. M. Lemmon, R. M. Noller, R. Ostwald, and Melvin Calvin. Feb. 27, 1953. 10p. (UCRL-2116)

Varying amounts of radiation decomposition during storage in the dry form have been found in the cases of C^{14}-labeled valine, norvaline, norleucine, choline chloride, Ca glycolate, and cholesterol. These data indicate that investigators using labeled organic compounds should make frequent checks of the purity of these compounds in order to exclude the possibility of the presence of decomposition products. (auth)

RADIATION EFFECTS

3031

REDUCTION OF CERIC SALTS AND OXIDATION OF FERROUS SULFATE BY POLONIUM α PARTICLES. Moïse Haïssinsky and Maria do Carmo Anta. Compt. rend. 236, 1161-3(1953) Mar. 16. (In French)

Reduction of Ce(IV) by Po dissolved in the same 0.8N sulfuric, perchloric, or nitric acid solution is complete for a sufficient dose. Reduction yield for concentrations between 10^{-4}M and 3×10^{-3}M in H_2SO_4 solution is proportional to dose up to almost complete reduction, and is independent of the Ce(IV) concentration, but varies with the nature of the anion and with the Po concentration. The oxidation of 10^{-3}M $FeSO_4$ in 0.8N H_2SO_4 does not change with Po concentration from 1.86×10^{-2} to 74.6×10^{-2} mc/cc. (G.Y.)

3032

β-RAY INITIATION OF POLYMERIZATION OF STYRENE AND METHYL METHACRYLATE. W. H. Seitzer, R. H. Goeckermann, and A. V. Tobolsky. J. Am. Chem. Soc. 75, 755-6(1953) Feb. 5.

Rates of β-ray-induced polymerization of styrene, methyl methacrylate, and an equimolar mixture of these two monomers were measured at 30.5°C. Percentages of the absorbed radiant energy effective in producing the polymerization-initiating radicals were determined. (G.Y.)

RARE EARTHS AND RARE-EARTH COMPOUNDS

3033

Ames Lab.

THE OXIDATION OF WATER BY CERIUM(IV) PERCHLORATE. Frederick R. Duke and John A. Anderegg. [Jan. 15, 1953]. 4p. (ISC-295)

A reinvestigation of the kinetics of Ce(IV) in $HClO_4$ solutions has shown the reaction to be heterogeneous and to involve a neutral hydroxyl radical. The mechanism seems to be: (1) Ce(IV) reversibly adsorbed on a surface; (2) adsorbed Ce(IV) reacts reversibly with H_2O to give Ce(III), adsorbed HO, and H^+; (3) adsorbed HO irreversibly yields H_2O_2 (slow step); (4) Ce(IV) reacts with H_2O_2 irreversibly to yield H^+, O_2, and Ce(III) (fast step). The order of the reaction appears to depend on the points of equilibrium of the first two reactions and the relative extent of adsorption of Ce(IV), Ce(III), and H^+. (J.S.R.)

3034

Ames Lab.

THE PREPARATION OF SAMARIUM AND YTTERBIUM METALS. A. H. Daane, D. H. Dennison, and F. H. Spedding. [Mar. 23, 1953]. 3p. (ISC-326)

The possible high vapor pressure of Sm and the low vapor pressure and low boiling point of La, along with the high heat of formation of its oxide, permitted the preparation of Sm by distilling it from a heated mixture of the oxides under a vacuum. The distilled Sm had a purity of more than 98%. Yb was prepared by the same method. X-ray-diffraction studies were made of the two metals. (J.S.R.)

SEPARATION PROCEDURES

3035

Mound Lab.

RADIUM-BARIUM SEPARATION PROCESS. 2. CHROMATE FRACTIONATION PROCEDURES: [FINAL REPORT]. M. L. Salutsky, J. G. Stites, E. F. Joy, A. W. Martin, J. H. Payne, Jr., and M. Economides. Apr. 1, 1951. Decl. Mar. 25, 1953. 50p. (AECD-3508; MLM-724)

A comprehensive study was made of various fractionation systems for the fractional separation of Ba-Ra mixtures. The most efficient and simplest fractionation scheme was chosen on the basis of the thermodynamics of separating the constituents of mixed crystals and of combining fractions in a system of repeating composition. This scheme was applied to the separation of Ba and Ra by utilizing the countercurrent batch fractionation of the chromates. The chromate procedure was evaluated by a comparison with the classic methods which employ the fractional crystallization of the halides. The chromate method is more practical on the basis of Ra enrichment per fractionation step, control of precipitating conditions, simplicity, and speed of operation. (For previous report in series see MLM-723.) (auth)

3036

Argonne National Lab.

ELECTROCHROMATOGRAPHIC SEQUENCES. T. R. Sato, William P. Norris, and Harold H. Strain. Feb. 1953. Decl. Apr. 8, 1953. 27p. (AECD-3516; ANL-WMM-1070)

Mixtures of ions such as those of Ag, Ni, and Cu, have now been resolved by differential electrical migration in various electrolytic solutions immobilized in paper. Each mixture, added as an initially narrow zone, yielded the separated components as a series of discrete zones. The formation and the sequence of these zones varied with the electrolytic solution. The number of sequences varied with the number of zones and with the migrating ions, as well as with the electrolytic solution. The sequences were affected by the formation of complex ionic species in the solutions. Sequences of some rare-earth ions were affected by sorption of the migrating species on the paper. The sequences have revealed the condition of the ions in some of the electrolytic solutions, they have provided a basis for the development of new analytical procedures, and they have aided interpretation of the separation of mixtures by one-way and by continuous electrochromatography. (auth)

3037

Rensselaer Polytechnic Inst.

A SPECTRO-CHEMICAL STUDY OF THE SOLVENT EXTRACTION OF FERRIC CHLORIDE BY ISOPROPYL

ETHER. Anders H. Laurene. Sept. 4, 1952. 106p. (AECU-2484)

The crystalline anhydrous dietherate of tetrachloroferric acid has been prepared and its behavior with water has been studied. The hydrated acid was shown by spectrochemical means to be identical with the complex which is extracted by isopropyl ether from HCl containing $FeCl_3$. It has been found that water is essential for the extraction of the $FeCl_3$ complex and that water is the controlling factor in the formation of a third phase in the extraction system. Spectrochemical evidence is presented in support of the current theory that the extractable complex of the $FeCl_3$ extraction system originates in the aqueous phase through a series of equilibria between ferric and chloride ions. The molar equilibrium constant for the formation of the tetrachloroferrate complex in aqueous solution from ferric and chloride ions was determined at 25°C and ionic strength 19.9. The constant for the distribution of the tetrachloroferrate complex between isopropyl ether and HCl containing $FeCl_3$ in the range of ideal distribution has been calculated for 25°C. Extraction of Fe was found to take place from aqueous chloride salt solutions containing $FeCl_3$ and no added HCl. It has been shown that Li tetrachloroferrate may be extracted by isopropyl ether and that LiCl exerts a "salting out" influence upon $HFeCl_4$ in the extraction system. (auth)

3038

McCollum-Pratt Inst., Johns Hopkins Univ.

A METHOD FOR QUANTITATIVE SEPARATION AND ASSAY OF CHOLINE AND DIMETHYLETHANOLAMINE IN ANIMAL TISSUES. N. A. Hulme and Robert Ballentine. [1951]. 19p. (AECU-2504)

A method for quantitatively separating choline, dimethylethanolamine, and removing methionine and trichloroacetic acid by means of ionic exchange resins is described. A biological assay for choline and dimethylethanolamine has been worked out using a cholineless mutant of Neurospora crassa. The choline content of various rat tissues has been assayed, and the presence of dimethylethanolamine in these tissues has been demonstrated. This latter base appears mainly in the lipid fraction in liver. (auth)

3039

Ames Lab.

A NEW TECHNIQUE FOR THE SEPARATION OF RADIOPHOSPHORUS FROM SULFUR. L. D. McIsaac and A. Voigt. June 1952. 33p. (ISC-271)

The preparation of P^{32} by the nuclear reaction $S^{32}(n,p)P^{32}$ presents the difficult problem of the separation of P from S particularly difficult if carrier P is not to be used. A new approach to this separation has been found which makes a unique use of ion-exchange resins. Separations using resin columns are especially suited to problems involving radioactivity since they require a minimum of handling. In this method, a cation exchange resin, Nalcite HCR, was converted to a ferric ion form by passing ferric chloride through it in slightly acid solution. Passage of 2M NH_4OH through the iron-form resin converts the iron to the hydroxide without removing it from the resin. The resulting exchange bed is highly selective for phosphate with respect to sulfate and most other common anions. This selectivity is so pronounced that carrier-free phosphate, obtained by dissolving irradiated sulfate in water, is quantitatively adsorbed while the sulfate goes through the bed without loss. Washing with water removes the last traces of sulfate. The phosphate can then be removed from the bed in a sharp band by using dilute NaOH as eluant. This solution, while it might be satisfactory for some purposes, contains a fairly high base concentration. A second bed of Nalcite in the hydrogen cycle will replace the NaOH with water without affecting the P and the final solution contains only $H_3P^{32}O_4$. (auth)

3040

Ames Lab.

A RAPID METHOD FOR FRACTIONATING CRUDE RARE EARTH ORES INTO MIXTURES GREATLY ENRICHED WITH REGARD TO PARTICULAR RARE EARTHS. E. J. Wheelwright and F. H. Spedding. [Feb. 1, 1953]. 7p. (ISC-332)

Preliminary experiments indicate that efficiency of producing very pure rare earth oxides by ion-exchange methods can be increased if the crude rare earth mixtures, as leached from the ores, can first be rapidly fractionated into several fractions, enriched in specific rare earths. The present procedure, together with results, is briefly outlined. (J.E.D.)

3041

Oak Ridge National Lab.

PURIFICATION OF FISSION-PRODUCT RARE EARTHS BY ION EXCHANGE. R. S. Pressly and A. F. Rupp. Issued Apr. 20, 1953. 33p. (ORNL-1313)

Procedures for separation and purification of fission-product rare earths of sufficient purity for the radioisotope distribution program are described. The separations, involving curie levels of activity, are made on heated and unheated resin columns. The products are removed by elution, using complexing agents at various pH levels. No isotope carrier is added. (L.T.W.)

3042

Atomic Energy Project, Univ. of Calif., Los Angeles

THE CHROMATOGRAPHIC SEPARATION OF THE PLASMA LIPIDS. Dorothy L. Fillerup and James F. Mead. Apr. 1, 1953. 14p. (UCLA-251)

By chromatography on a silicic acid column, plasma lipids may be separated into sterol esters, triglycerides, sterols, fatty acids, and phospholipids. By this technique eleostearic acid is found exclusively in the triglyceride fraction after having been fed as the methyl ester. (auth)

3043

CHROMATOGRAPHIC SEPARATION OF FRANCIUM. Marguerite Perey and Jean-Pierre Adloff. Compt. rend. 236, 1163-5(1953) Mar. 16. (In French)

The purpose of this investigation was to obtain, in minimum time, pure AcK (Fr^{223}) free from all members of the Ac family and without salt entrainment. The method of paper chromatography was applied. (tr-auth)

3044

SEPARATION OF NIOBIUM AND TANTALUM BY CHROMATOGRAPHY ON ACTIVATED ALUMINA. Nicolas Tikhomiroff. Compt. rend. 236, 1263-5(1953) Mar. 23. (In French)

The separation of Nb and Ta is based on the adsorption of the two elements from oxalic solution on activated alumina and their elution at different pH's. Ta is only partially retained on the alumina. (tr-auth)

3045

ABSORPTION OF INORGANIC SALTS FROM ORGANIC SOLVENTS ONTO ANION EXCHANGE RESINS. Leonard I. Katzin and Elizabeth Gebert. J. Am. Chem. Soc. 75, 801-3(1953) Feb. 20.

An abstract of this material was indexed as report AECU-1154 and appears in Nuclear Science Abstracts as NSA 5-2741. (G.Y.)

SORPTION PHENOMENA

3046

Rock Island Arsenal Lab.

RADIOMETRIC STUDY OF THE ADSORPTION CHARACTERISTICS OF STEARIC ACID. Stanley L. Eisler. June 20, 1952. 29p. (U-23153; Report 18)

The feasibility of using radiometric techniques to determine the degree of adsorption of polar organic compounds on steel surfaces was established. A satisfactory method

was developed which employed clean, sandblasted steel coupons immersed in an oil solution having a viscosity of 55 to 50 centistokes at 210°F and containing 10 millimoles 5%-radioactive stearic acid/l. A vapor degreasing treatment was used consisting of eight 5-min degreasing cycles with 10-min cooling periods interspersed. After each cycle the coupons were cooled and counted by means of a G-M mica-window tube. The adsorption rate varied with immersion time, increased when the coupons were agitated, and proved independent of time and temperature during the drainage period. The amount of stearic acid adsorped per coupon appeared to vary directly with the concentration of the acid up to approximately 30 millimoles/l; above this concentration, a leveling off may occur. (TID-LC)

3047

THE KINETICS OF ABSORPTION UNDER CONDITIONS OF INTENSE MIXING. M. Kh. Kishinevskiĭ. Translated from Zhur. Priklad. Khim. 24, 542-5(1951). 6p. (AEC-TR-1501; AERE-Trans. 11/3/5/268)

Starting from the concept of the transport of substance by mass flow, an equation of the kinetics of absorption has been obtained which is applicable to a wide range of turbulence for processes accompanied by reactions of the first order. (auth)

3048

ADSORPTION AND SOLUTION OF HYDROGEN BY DISPERSED NICKEL-PALLADIUM ALLOYS. I. P. Tverdovskiĭ and Zh. L. Vert. Doklady Akad. Nauk S.S.S.R. 88, 305-8 (1953) Jan. 11. (In Russian)

H_2 adsorption and solution on dispersed Ni, Pd, and Ni-Pd electrodes in KOH solution at 20°C was studied with respect to alloy composition. (G.Y.)

SPECTROSCOPY

3049

Gates and Crellin Labs. of Chemistry, Calif. Inst. of Tech.

ION-EXCHANGE AND SPECTROPHOTOMETRIC INVESTIGATION OF IRON(III)-SULFATE COMPLEX IONS. Roy A. Whitaker and Norman Davidson. [1952]. 25p. (AECU-2488)

The distribution equilibriums of Fe(III) between an ion exchange resin and solutions at $\mu = 1.0$, $(H^+) = 1.0$, containing $HClO_4$ and H_2SO_4, and Fe(III) = 3×10^{-4} F have been measured at 28° and interpreted in terms of the equilibrium constants, $\underline{K}_1 = (FeSO_4^+)/(Fe^{+3})(SO_4^{--}) = 95$, $(\underline{K}_2/\underline{K}_1) = (Fe(SO_4)_2^-)/(FeSO_4^+)(SO_4^{--}) = 9.4$. Spectrophotometric studies at 27 ± 2° of similar solutions show a marked contribution to the absorption spectrum by $FeSO_4^+$ in the 270-350 mμ range, and lead to a value of $\underline{K}_1$ of 101-121. The recommended value is therefore 107(±20) liter/mole. The absorption spectra of Fe(III) solutions at $H^+ = 4 \times 10^{-3}$ F with $(SO_4^{--}) =$ 0.1-0.0 M are consistent with the value of 9.4 for $\underline{K}_2/\underline{K}_1$. The extinction coefficients of $FeSO_4^+$ and $Fe(SO_4)_2^-$ have been determined. Data on the affinity of sulfate for various cations are tabulated and reviewed. (auth)

3050

MULTIPLICITY IN X-RAY EMISSION SPECTRA. I. B. Borovskiĭ and T. M. Golovner. Doklady Akad. Nauk S.S.S.R. 88, 233-6(1953) Jan. 11. (In Russian)

Data on electron configurations and transitions in the rare-earth elements from Ce to Lu (not including Pm) are presented. (G.Y.)

SYNTHESES

3051

California Univ., Berkeley. Coll. of Agriculture

PREPARATION OF C^{14}-LABELED D-GALACTOSE AND GLYCEROL. R. C. Bean, E. W. Putman, Raúl E. Trucco, and W. Z. Hassid. [1952]. 10p. (AECU-2506)

A biosynthetic method for the preparation of C^{14}-labeled D-galactose and glycerol, using a red alga, Irideae laminarioides, is described. The method for isolation of these compounds is based on the fact that this marine plant contains a galactoside, α-D-galactopyranosyl-glycerol, which on hydrolysis produces D-galactose and glycerol. Of the CO_2 activity initially used, approximately 25 and 12% had been incorporated into the D-galactose and glycerol, respectively. The specific activity of the D-galactose was 52, and that of glycerol 42 μc/mg. (auth)

3052

Naval Medical Research Inst., Bethesda

SYNTHESIS OF l-PHENYLALANINE CONTAINING ISOTOPIC NITROGEN. Henry David Baldridge, Jr., William J. McCarville, and Julius Sendroy, Jr. Nov. 5, 1952. 9p. (NM-007-099; Report 1)

A synthesis is described for l-phenylalanine containing approximately 31.9 at.% excess of the heavy isotope of nitrogen, N^{15}. This labeled amino acid will subsequently be used in a study of the rate of metabolism of amino acids in man. By means of the azlactone method of producing amino acids, benzaldehyde and acetylglycine were condensed to give alpha-acetamino-cinnamic acid. Hydrolysis of this substance yielded phenylpyruvic acid. Reductive amination of this keto acid, using ammonia prepared from $N^{15}H_4NO_3$, produced heavy-nitrogen-labeled dl-phenylalanine. Treatment of this amino acid with acetic anhydride gave acetyl-dl-phenylalanine, which was resolved by means of the papain-catalyzed synthesis of acetyl-l-phenylalanine-p-toluidide. The l-toluidide was then hydrolyzed to the corresponding amino acid, l-phenylalanine. (auth)

3053

Pittsburgh Univ.

TWO NEW SYNTHESES OF DIPHENYLTRIFLUOROMETHYLCARBINOL. Thomas F. McGrath, Lloyd B. Barkley, and Robert Levine and 2-TRIFLUOROACETYL- AND 2-HEPTAFLUORO-n-BUTYRYLCYCLOHEXANONE. Lloyd B. Barkley and Robert Levine. Issued Feb. 16, 1953. 5p. (NYO-3384)

Diphenyltrifluoromethylcarbinol can be synthesized in yield of 93.6% from trifluoroacetophenone and excess phenyllithium. It may also be prepared in 87.6% yield by use of ethyl trifluoroacetate instead of trifluoroacetophenone. 2-Trifluoroacetylcyclohexanone can be synthesized from sodium methoxide, cyclohexanone, and ethyl trifluoroacetate in yield of 61%. From cyclohexanone, sodium methoxide, and ethyl heptafluoro-n-butyrate, 2-heptafluoro-n-butyrylcyclohexanone can be synthesized in 59.5% yield. M.p. and b.p. are given. (J.S.R.)

3054

SYNTHESIS OF PENTANE-1-C^{14} AND PENTANE-3-C^{14}. A. F. Lukovnikov, M. B. Neĭman, A. A. Bag, L. M. Rodionova, I. S. Samoukina, and N. V. Bliznyak. Doklady Akad. Nauk. S.S.S.R. 88, 297-300(1953) Jan. 11. (In Russian)

Synthesis of 1- and 3-C^{14}-labeled pentanes from $C^{14}O_2$ by way of the butyl Grignard reagent, esterification of the resulting acid with C_2H_5OH, and reduction of the ester with H_2 is described. (G.Y.)

3055

A COMPOUND OF RADON WITH p-CHLOROPHENOL. B. A. Nikitin and E. M. Ioffe. Doklady Akad. Nauk S.S.S.R. 85, 809-10(1952) Aug. 1. (In Russian)

The compound $Rn \cdot 3ClC_6H_4OH$ was prepared by coprecipitation with the analogous H_2S compound, $H_2S \cdot 3ClC_6H_4OH$. The coprecipitation follows Khlopin's rule (G.Y.)

3056

SYNTHESES WITH ISOTOPIC TRACER ELEMENTS. V. [$^{14}C_1$] BENZENE. H. S. Turner and R. J. Warne. J. Chem. Soc., 789-95(1953) Mar.

A method is described for the preparation of benzene-1-C^{14} from $C^{14}O_2$ in 75% yield. A preliminary report was published earlier (NSA 5-6177). (G.Y.)

3057

SYNTHESIS OF ETHYL ALCOHOL LABELED WITH ISOTOPIC CARBON C^{14}. T. I. Andrianova, E. A. Andreev, and O. M. Sokolova. Doklady Akad. Nauk S.S.S.R. 88, 677-8(1953) Feb. 1. (In Russian)

Synthesis of $CH_3C^{14}H_2OH$ by a Grignard reaction is described. (G.Y.)

TRACER APPLICATIONS

3058

STUDIES IN LOW CONCENTRATION CHEMISTRY. III. THE RADIOCOLLOIDAL PROPERTIES OF YTTRIUM-90. George K. Schweitzer, Bernard R. Stein, and Wm. Morrison Jackson. J. Am. Chem. Soc. 75, 793-5(1953) Feb. 20.

Y^{90}, the daughter of Sr^{90}, has been removed in the carrier-free form from its parent by utilization of the radiocolloidal properties of Y in low-concentration solutions. Using solutions of Y^{90}, the effects of coagulation time, pH, the presence of various electrolytes and the presence of nonaqueous solvents upon the ease of removal of Y^{90} from its solutions by filtration have been investigated. Also the ability of the radiocolloids to re-form after an initial removal, as well as the efficiencies of various grades of filter paper in removal of the activity, has been studied. The results are in agreement with previous observations on this and other elements. (auth)

3059

SEPARATION OF Na^{22} FROM A Mg TARGET BY ELECTROLYSIS WITH A RENEWABLE MERCURY CATHODE (LABORATORY NOTE). Marius Chemla and Jules Pauly. Bull. soc. chim. France, 432(1953) Apr. (In French)

Carrier-free Na^{22} can be separated from Mg by electrolysis of a HCl solution of the target with a circulating-Hg cathode; only the Na forms an amalgam, which is then decomposed with H_2O. (G.Y.)

URANIUM AND URANIUM COMPOUNDS

3060

THE ELECTROLYTIC PRODUCTION OF QUADRIVALENT URANIUM. H. K. El-Shamy and S. El-Din Zayan. J. Chem. Soc., 384-6(1953) Feb.

The conditions for the complete electrolytic reduction of acid uranyl chloride solutions to quadrivalent U have been studied, especially the factors affecting the limiting current density and hence the efficiency of the main cathodic process. The reduction was followed quantitatively through time-potential curves under various conditions. (auth)

WASTE DISPOSAL

3061

Johns Hopkins Univ.

BEHAVIOR OF INSTITUTIONAL INCINERATORS WHEN USED TO BURN RADIOACTIVE WASTES: FINAL PROJECT REPORT [FOR] AUGUST 1, 1950–NOVEMBER 1, 1952. C. W. Kruse, P. V. Freese, A. Machis, and V. C. Behn. Nov. 1, 1952. 58p. (NYO-4517)

This report deals with the development of methods and techniques for measuring the amounts of radioisotope on the stack wall, in ash, stack gas, and atmosphere during and after incineration in the conventional refuse-type destructor. Controlled experiments were conducted with P^{32}, I^{131}, and Sr^{89}. It was found that with P^{32} and Sr^{89} about 90% of the isotope remains in the ash where it may produce a hazard during ash removal and disposal. With I^{131} about 80% of the isotope charged is in the stack discharge; however, it is shown that to reach undesirable atmospheric concentrations, the I^{131} loading would greatly exceed amounts permitted for safety in ash handling. (auth)

ENGINEERING

AEROSOLS

3062

Illinois Univ. Engineering Experiment Station

[FILTRATION OF SMALL AEROSOL PARTICLES BY FILTER MATS.] W. E. Ranz and R. K. Finn. Jan. 1, 1953. 30p. (SO-1009; Technical Report 8)

This report consists of two sections. The Role of Particle Diffusion and Interception in Aerosol Filtration contains discussions of the nature of particle diffusion, particle-transfer rates for cylindrical collectors, the efficiency of interception for viscous flow around a cylinder, Langmuir's equation for efficiency of impaction by diffusion, and a theoretical basis for determining particle size of maximum penetration. Determination of the Drag on a Cylindrical Fiber at Low Reynolds Number contains data on drag coefficients for a cylinder measured at Reynolds numbers from 0.06 to 6.0 by observing the deflections of thin wires suspended in a uniform air stream. The results confirm a theoretical equation proposed by Lamb and are consistent with experimental data of other investigators. (C.H.)

HEAT TRANSFER AND FLUID FLOW

3063

[Oak Ridge National Lab.]

HEAT GENERATION IN A SLAB FOR A NON-UNIFORM SOURCE OF RADIATION. William S. Farmer. Sept. 4, 1952. 5p. (CF-52-9-202)

The local heat-generation rate in a slab as a result of radiation, for the case of a nonuniform neutron flux or source distribution in the slab, has been solved for several general conditions. The solutions presented cover the situation in which the neutron flux distribution can be represented as a power series in one dimension or as an exponential expression. (auth)

3064

Oak Ridge National Lab.

TRANSIENT METHODS FOR DETERMINING THERMAL CONDUCTIVITY OF LIQUIDS. W. B. Harrison. Nov. 1, 1952. 9p. (CF-52-11-113)

The transient method of thermal-conductivity determination described consists of measuring the temperature variation with time at the surface of a heated wire situated along the axis of a cylindrical vessel containing the liquid. From the nature of the analytical relationship between heater surface temperature and time, the experimental data can be used to obtain the thermal diffusivity of the liquid. The differential equation of heat flow is solved for specified boundary conditions, and the solution is discussed for certain limiting cases. (L.T.W.)

3065

Lewis Flight Propulsion Lab., NACA

SMOKE STUDIES OF SECONDARY FLOWS IN BENDS, TANDEM CASCADES, AND HIGH-TURNING CONFIGURATIONS. Arthur G. Hansen, Howard Z. Herzig, and George R. Costello. Mar. 11, 1953. 33p. (NACA-RM-E52L24a)

Flow-visualization studies, using smoke, were made of the secondary flows in rectangular bends, tandem cascades, and high-turning configurations. The roll-up of the wall boundary layer of a rectangular bend forms a passage vortex near the suction surface similar to that previously observed

for cascades. The vortex so formed then shifts out into the main stream. (L.T.W.)

3066

Lewis Flight Propulsion Lab., NACA

ANALYSIS OF HEAT TRANSFER AND FLUID FRICTION FOR FULLY DEVELOPED TURBULENT FLOW OF SUPERCRITICAL WATER WITH VARIABLE FLUID PROPERTIES IN A SMOOTH TUBE. Robert G. Deissler and Maynard F. Taylor. Apr. 9, 1953. 29p. (NACA-RM-E53B17)

A previous analysis of turbulent flow and heat transfer for air with variable properties flowing in smooth tubes is generalized in order to make it applicable to supercritical water. The generalization is necessary because all the pertinent properties of supercritical water vary markedly with temperature. Calculated velocity and temperature distributions, as well as relations among Nusselt number, Reynolds number, and friction factor, are presented. The effect of variation of fluid properties across the tube on the Nusselt number and friction factor correlations can be eliminated by evaluating the properties at a reference temperature which is a function of both the wall temperature and the ratio of wall-to-bulk temperatures. (auth)

3067

Massachusetts Inst. of Tech.

BOILING HEAT TRANSFER PROJECT MONTHLY PROGRESS REPORT. George Henry, Milton W. Raymond, and Joseph B. Walsh. Mar. 1, 1953. 21p. (NP-4501)

Visual density data are presented at a bubble velocity of 20 fps for pressures of 500, 1000, 1500 psia and for temperatures in the range 350 to 550°C. (L.T.W.)

3068

EXPERIMENTAL DETERMINATION OF LOCAL AND AVERAGE COEFFICIENTS OF HEAT TRANSFER DURING TURBULENT FLOW OF LIQUIDS IN TUBES. I. T. Alad'ev. Translated from Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk. 1669-81(1951). 19p. (AEC-TR-1493; AERE-Trans. 11/3/5/262)

The variation of local and average coefficients of heat transfer along the tube length were studied. With an established turbulent flow of liquid in the tube, the local values of the coefficient of heat transfer fall along the length of the tube almost to the section at a distance of 40 tube diameters from the inlet section of the tube. The average values of the heat-transfer coefficient decreases with increasing relative length of tube. (L.T.W.)

3069

HEAT TRANSFER MEASUREMENTS WITH MERCURY. D. Elser. Translated by Ronald Kay from Schweiz. Arch. Angew. Wiss. u. Tech. 14, 330-6(1948). 18p. (AEC-TR-2016)

Measurements of turbulent flow of Hg in a pipe were made in order to obtain experimental verification of laws concerning heat transfer in the region of very small Prandtl Numbers. (auth)

3070

THERMALLY INSULATED FLOW OF VISCOUS GAS IN A SUPERSONIC NOZZLE A. L. Klyachkin. Zhur. Tekh. Fiz. 22, 1455-66(1952) Sept. (In Russian)

A method for calculating thermally insulated supersonic flow through a nozzle is derived. (G.Y.)

3071

BOILING OF GAS-FILLED LIQUID. E. I. Nesis and Ya. I. Frenkel. Zhur. Tekh. Fiz. 22, 1500-5(1952) Sept. (In Russian)

Solution of gas in the metastable state, i.e., when the total vapor pressure of dissolved gas and solvent exceeds the external pressure, is analyzed. Velocity of boiling is found to depend only on total saturation, not on the ratio of partial saturations. (G.Y.)

3072

BOILING UNDER ACTUAL CONDITIONS. E. I. Nesis. Zhur. Tekh. Fiz. 22, 1506-12(1952) Sept. (In Russian)

The factors facilitating liquid boiling are analyzed. The shape of bubbles on the bottom of the vessel and the mechanism governing their separation and upward flow are discussed, as well as the effect of pores in the walls of the vessel. (G.Y.)

MATERIALS TESTING

3073

Atomic Energy Research Establishment, Harwell, Berks (England)

RHEOLOGICAL PROPERTIES OF GLASS AND SODIUM FLUORIDE AT ELEVATED TEMPERATURES. E. B. Allison. Nov. 1952. 25p. (AERE-M/R-1058)

Scott's theory of compression of disks is applied to deformation-time curves obtained for glass and sodium fluoride at various temperatures. It is found that a sample of soda glass tested at 655°C behaves as a Newtonian fluid, the viscosity being approximately 5×10^8 poises. NaF, however, in the temperature range 870 to 970°C, appears to behave as a Bingham solid. The yield-stress values are of the order of 10^6 to 10^7 dynes/cm^2 and the viscosity coefficients range from 10^9 to 10^{10} poises. Values of yield stress and viscosity are deduced from sintering data using the Shuttleworth-Mackenzie equations. These values are of the same order of magnitude as those determined experimentally. (auth)

VACUUM SYSTEMS

3074

Livermore Research Lab., Calif. Research and Development Co.

DEVELOPMENT OF A LARGE, LINEAR JET, MERCURY DIFFUSION PUMP HAVING HIGH PUMPING SPEEDS IN THE 10^{-6} mm MERCURY ABSOLUTE PRESSURE RANGE. E. R. Lind and J. F. Steinhaus. Jan. 13, 1953. 44p. (MTA-14)

Development work was started on a large linear jet-type Hg diffusion pump when it was considered necessary to have a diffusion pump with a very large pumping capacity in the 10^{-6} mm Hg absolute pressure range. Since previously designed large pumps were enlarged conventional round pumps, it was decided to try a different approach. Operation of the Livermore linear accelerator has shown that the present 32-in. diffusion pumps would be inefficient in the operation of any system of like magnitude or greater. On the basis of an original design conceived and developed by Dr. K. M. Simpson, a test pump with a rectangular aperture, or connecting flange, 28 in. by 72 in. was designed and built for experimental development. In the operation of this test unit pumping speeds of 50,000 liters of air/sec. have been observed in the 5×10^{-7} mm Hg absolute pressure range. The pump is economical, using only 5 kw of power. The ultimate pressure (base pressure) is less than 1×10^{-7} mm Hg, fore-pressure tolerance is 30 μ. The findings of these investigations show that large diffusion pumps of similar design should be used wherever efficient pumping is desired on a vacuum system requiring large pumping capacity in the low 10^{-6} mm Hg pressure range. (auth)

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

3075

Atomic Energy Research Establishment, Harwell, Berks (England)

FREE LIME IN SINTERED CALCIUM FLUORIDE CRUCIBLES. P. Murray and J. Taylor. Jan. 15, 1953. 21p. (AERE-M/R-1097)

It has been shown that the crumbling of CaF_2 crucibles, on standing after fabrication, is due to the presence of free lime formed during the sintering process by thermal decomposition of tricalcium silicate. The latter arises from the reaction between the fluoride and the silica impurity on initial calcination at 1300°C. It is concluded that the calcium fluoride powder must be silica free as prepared to eliminate this possibility. (auth)

3076

Oak Ridge National Lab.

CRUCIBLE HANDBOOK: A COMPILATION OF DATA ON CRUCIBLES USED FOR CALCINING, SINTERING, MELTING, AND CASTING. M. A. Schwartz, G. D. White, and C. E. Curtis. Issued Apr. 17, 1953. 32p. (ORNL-1354)

Information concerning the properties of commercially available nonmetallic crucibles compiled from published and unpublished sources is furnished to aid the casual worker in ascertaining the crucible best suited for his work. Sources of supply are given and also methods of fabrication for those wishing to fabricate their own crucibles. (J.S.R.)

GEOLOGY AND MINERALOGY

3077

Columbia Univ.

ANNUAL REPORT FOR JUNE 30, 1952 TO APRIL 1, 1953. Paul F. Kerr, P. K. Hamilton, Gerald P. Brophy, W. L. Simpson, William Cohen, Harry Dahl, and Jack Green. Issued Apr. 1953. 99p. (RME-3046)

This report, devoted to prospecting in the Marysvale area, Utah, includes the alteration of a vitrophyre dike in the Bullion Monarch mine, a study of the La Veta Prospect near Marysvale, hydrous uranium molybdate in the Marysvale ore, occurrence of U in the Deer Trail area, brief note on pitchblende and uraninite, radioactive features of vein minerals in Prospector mine, and the geochemical aspects of alteration at Marysvale. (J.E.D.)

3078

Division of Raw Materials, AEC

AN INVESTIGATION OF SUBSURFACE ISORAD METHODS, TEMPLE MOUNTAIN, SAN RAFAEL DISTRICT, UTAH. David N. Hinckley. Sept. 2, 1952. (RMO-824)

The subsurface isorad method is an attempt to effectively locate areas favorable to U ores by the use of contour maps which show localities of greater radioactivity. The construction of isorad maps entails the measurement of the area under the curve of the γ-ray log. The figures obtained indicate relative amounts of γ radiation and are used to locate the isorad contours. This work was started at Temple Mountain in the San Rafael Swell area during the spring of 1952. The purpose of this investigation is to determine the most effective and economic hole spacing for subsurface isorad work. The lower 45 ft. of the ore-bearing Shinarump conglomerate was divided into three intervals each 15 ft. thick. These intervals were considered individually and also as a composite unit. For each interval 12 isorad maps were constructed based on varying hole patterns. For each pattern a composite isorad map was made combining all three intervals. About 98% of the ore holes fell within the 200 contour on the "base" isorad maps; consequently, this area is considered the "target" area. Study of the maps of each interval shows that this target area can be located most effectively and economically with a hole spacing of 225 to 300 ft. At this spacing 79 to 83% of the ore holes fall within the 200 contour which saves 37 to 43% of the holes drilled under present methods not utilizing isorad techniques. A study of the composite isorad maps indicates similar results could be obtained with a hole spacing of 200 to 275 ft. This spacing would locate 93 to 95% of the ore holes within the 200 contour with a saving of 12 to 15% of the holes drilled under the present methods not utilizing isorad techniques. (auth)

3079

Geological Survey

A PRELIMINARY DETERMINATION OF THE AGE OF SOME COLORADO PLATEAU URANIUM ORES BY THE LEAD-URANIUM METHODS. L. R. Stieff, T. W. Stern, and R. G. Milkey. Jan. 1953. 50p. (TEI-268)

A study of the Pb^{206}/U and Pb^{207}/U^{235} ages and the Pb^{207}/Pb^{206} ratios of the Colorado Plateau U ores has been undertaken because of the direct bearing on the origin of these ores. A preliminary treatment of the data for 41 ore samples containing more than 0.1% U gives a mean Pb^{206}/U age of approximately 71 million yr, a mean Pb^{207}/U^{235} age of approximately 82 million yr, and a mean Pb^{207}/Pb^{206} ratio equivalent to an age of 425 million yr. At least part of the large discrepancy between the mean Pb-U ages and the much less reliable Pb^{207}/Pb^{206} ages is due to small systematic mass-spectrometric errors. The extreme sensitivity of the Pb^{207}/Pb^{206} ratio to small mass-spectrometric errors invalidates not only the Pb^{207}/Pb^{206} ages but also the corrections for the presence of old radiogenic lead and the selective loss of radon which must be based on precise determinations of the Pb^{207}/Pb^{206} ratio. Errors in the chemical analyses for Pb and U introduce uncertainties in the mean Pb^{206}/U age of approximately ±3 million yr. The small systematic mass-spectrometric errors should not increase the mean Pb^{206}/U age by more than 3 million yr. Better corrections for common Pb and additional corrections for selective loss of U and the presence of old radiogenic Pb should lower the mean Pb^{206}/U age by approximately 10 million yr. If the entire Pb^{207}/Pb^{206} ratio anomaly is assumed to be due to the selective loss of radon, an improbable assumption, the mean Pb^{206}/U age would increase approximately 10 million yr. The data suggest that the calculated ages are close to the true age of the ores. From these calculated ages it is reasonable to assume that the U was introduced into the sediments not later than the end of the Cretaceous or the beginning of the Tertiary (55 to 75 million yr ago). This assumption differs markedly from the assumption that the present U deposits were formed in the late Triassic and late Jurassic sediments of the Colorado Plateau (152 and 127 million yr ago, respectively) during or soon after deposition of the sediments. (auth)

3080

Geological Survey

RADIOMETRIC RECONNAISSANCE NEAR MONTEZUMA, SUMMIT COUNTY, COLORADO. McClelland G. Dings. Feb. 1953. 12p. (TEI-296(pt.1))

An area of about 5 square miles centering around Montezuma, Colo., was examined for radioactive materials during the fall of 1952. The region contains abundant northeast-trending steeply dipping fissure veins that cut pre-Cambrian hornblende gneiss and quartz monzonite of Tertiary age. The typical vein minerals are galena, sphalerite, pyrite, and chalcopyrite in a gangue of quartz and barite. Abnormal radioactivity occurs at two prospects on two different veins; the U content ranges from 0.001 to 0.007%. (auth)

3081

Geological Survey

WAVELLITE SPHERULITES IN THE BONE VALLEY FORMATION OF CENTRAL FLORIDA. M. H. Bergendahl. Feb. 1953. 14p. (TEM-507)

Megascopic spherulitic aggregates of wavellite have recently been found in the Florida land-pebble phosphate

field. Petrographic studies were made to establish the identity of the mineral. Chemical and spectrographic data revealed the spherulites to be practically pure wavellite; the remainder is composed of phosphatic cement partly altered to wavellite. The origin of wavellite is considered to be secondary, a replacement of apatite which has undergone ground-water leaching. (auth)

3082

Geological Survey

PROGRESS REPORT ON ORIGINAL-STATE CORE STUDIES. G. E. Manger, Geological Survey and G. L. Gates, Bureau of Mines. Jan. 1953. 21p. (TEM-509)

Studies of original-state core samples of carnotite ores from the Colorado Plateau were planned to obtain data on the physical and chemical properties of core samples in which the content and composition of the interstitial water has not been radically altered by the flushing action of drilling water. Two experimental boreholes were completed in the Long Park area, Montrose County, Colo., using either oil-base mud or air as the circulating medium. Core recovery through the mineralized zone, using oil-base mud, was 100%; using air, it was 93.5%, except through bentonitic claystones. The core samples are satisfactory for the proposed laboratory studies. In air drilling and coring, condensation of water from drilling air may form mud collars and cause drill rods to stick. Drying the drilling air may result in increased efficiency of air-drilling operations. (auth)

3083

Geological Survey

RECONNAISSANCE FOR RADIOACTIVE DEPOSITS IN THE NORTHEASTERN PART OF THE SEWARD PENINSULA, ALASKA, 1945-47 AND 1951. H. R. Gault, P. L. Killeen, W. S. West, et al. 31p., 3 illus. (GS-C-250)

Field investigations indicate the content of radioactive minerals in the placer deposits from Sweepstakes and Rube Creeks to be too low for them to be significant as sources of U. No evidence of the bedrock source of the radioactive minerals present in the Candle Creek placer concentrates was obtained during the field investigations. The local concentration of uranothorianite in the placers at the head of Peace River in the Buckland-Kiwalik district indicate the best lead to possible high-grade U lode deposits on the basis of equivalent-U content and mineral association. (J.E.D.)

3084

Geological Survey

RECONNAISSANCE FOR RADIOACTIVE DEPOSITS IN THE LOWER YUKON-KUSKOKWIM HIGHLANDS REGION, ALASKA, 1947. M. G. White and P. L. Killeen. 21p. (GS-C-255)

Investigations in 1947 in the Lower Yukon-Kuskokwim region, Alaska found that previously reported radioactivity in the vicinity of Flat is due to uraniferous zircon, an accessory mineral in monzonite. The monzonite intrudes mafic igneous and Upper Cretaceous sedimentary rocks. The maximum equivalent-U content of the zircon is 0.14%, and the average content is probably near 0.13%. Chemical analysis of one sample of the most radioactive zircon indicates approximately 0.12% U and 0.03% thoria. The radioactive elements apparently are most commonly associated with reddish-brown inclusions within the zircon crystals. Tests of sulfide-bearing veins, black shales, and other rock types in the area around Flat showed no significant amount of radioactive material. Although there is little likelihood of finding high-grade U deposits in the area covered by the 1947 investigation, the fact that the predominant radioactive element in the monzonite is U may indicate that other intrusives of the same age in the Lower Yukon-Kuskokwim region might also contain uraniferous material. Possibilities of concentrations in attendant contact-metamorphic or vein deposits are suggested by a previously reported occurrence of zeunerite in a copper lode in this same general belt of intrusives. Radiometric and mineralogic study of 10 concentrate samples from the placers of Julian, Moore, and Candle Creeks, and the Cripple Creek Mountains, Lower Yukon-Kuskokwim Highlands region, Alaska, failed to reveal any significant amounts of U. Only the sample from Julian Creek shows an appreciable amount of radioactivity (0.03% equivalent U), but this is attributed entirely to Th in monazite. (auth)

3085

THERMAL ANALYSIS OF BETAFITE, A METAMICT MINERAL. Jean Orcel and Claude Lévy. Compt. rend. 236, 1177-9(1953) Mar. 16. (In French)

Differential thermal analysis of samples of betafite from Madagascar showed that the intensity of recrystallization of the mineral varies from deposit to deposit even though it should be constant since their U content and age should have rendered them completely amorphous, or, more precisely, metamict. The form of the curves suggest two interpretations susceptible to experimental verifications. (tr-auth)

3086

DIFFERENTIAL THERMAL ANALYSIS OF VARIOUS METAMICT MINERALS. Jean Orcel. Compt. rend. 236, 1052-4(1953) Mar. 9. (In French)

Differential thermal analysis curves of samples of betafite, samiresite, blomstrandite, ampangabeite, fergusonite, tyrite, euxenite, samarskite, priorite, orthite, zircon, gadolinite, and aeschynite are drawn. In some cases the curves differ greatly for different samples of the same mineral, while in other cases similar curves are shown for minerals of different chemical composition or crystal form. These analogies and differences may be explained by the chemical transformations accompanying or following metamictization. (G.Y.)

METALS AND METALLURGY

3087

Argonne National Lab.

URANIUM OXIDE PHASE EQUILIBRIUM SYSTEMS. PART 4. UO_2-ThO_2. Wingate A. Lambertson, Melvin H. Mueller, and Fred H. Gunzel, Jr. Feb. 20, 1953. Decl. Apr. 8, 1953. 9p. (AECD-3514)

UO_2 and ThO_2 form a continuous series of solid solutions with the solidus-liquidus extended from 2875°C for UO_2 to above 3200° for ThO_2. The melting point of ThO_2 is assumed to be about 3220 ± 50°C. (auth)

3088

Atomic Energy Research Establishment, Harwell, Berks (England)

THE THEORY OF D_0 IN THE ARRHENIUS EQUATION FOR SELF DIFFUSION IN CUBIC METALS. A. D. Le Claire. Jan. 20, 1953. 19p. (AERE-M/R-1104)

By assuming correlations between the various quantities occurring in the theoretical expressions for the self-diffusion coefficient appropriate to the various current mechanisms of diffusion, and other properties of the lattice to which such quantities are most closely related, it is shown that the experimentally observed values of D_0 and Q (in the equation $D=D_0\exp(-Q/RT)$) are consistent only with the supposition of vacancy and ring mechanisms in metals. Theoretical relations obtained for D may be used to estimate values of D for metals whose self-diffusion coefficients have yet to be measured. (L.T.W.)

3089

New York State Coll. of Ceramics, Alfred Univ.

HOT PRESSING OF TITANIUM CARBIDE. J. R. Tinklepaugh

and Eugene W. Holman. Mar. 1951. 21p. (ATI-108739; AF-TR-6537)

A simple apparatus was constructed for the hot pressing of Ti carbide in the 3500 to 4600°F temperature range. The pressing of four samples simultaneously with densities near the theoretical density of Ti carbide was accomplished. The various temperatures used in pressing are correlated with carbide grain size and the density of the parts produced. (auth)

3090

Ames Lab.

ROCKWELL AND VICKERS HARDNESS OF AMES THORIUM. Glenn Murphy and Emil Arbtin, Jr. Mar. 15, 1953. 13p. (ISC-316)

Charts are presented for the conversion of standard hardness numbers for Ames Th. The data were obtained from tests on over 100 billets having hardness numbers on the Vicker scale ranging from about 56 to 118. (auth)

3091

North American Aviation, Inc.

TITANIUM BRAZING. Harlan L. Meredith. Nov. 13, 1952. 13p. (NAA-AL-1560)

The inert-gas-shielded induction-heated brazing of Ti is described. Pure Ag is found to be the best bonding material. (C.H.)

3092

Missouri Univ. School of Mines and Metallurgy

ELECTRODEPOSITION OF TITANIUM; PROGRESS REPORT [FOR] OCTOBER 15 TO DECEMBER 15, 1952. 12p. (NP-4491; Progress Report 4)

Determinations of H overvoltage on Ti in various strengths of HF were made. Air was excluded from the cell, and a H atmosphere was maintained. Overvoltages were more negative than when solutions were exposed to air. Rates of dissolution of Ti in various molten salts under different conditions have been determined. The amount of attack is appreciable in almost all tests. Multiple deposits and continuous electrolysis from tartrate electrolytes containing Ti and Zn ions gives limited deposits containing both metals. (auth)

3093

New York Univ. Coll. of Engineering

HABIT PLANE DETERMINATION OF BETA IN ALPHA TITANIUM; FINAL REPORT. P. Albert. Dec. 5, 1952. 18p. (NP-4496; WAL-401/14-32)

Large α grains were produced in Ti-O and Ti-N alloys by a combination of annealing and hot working. Beta grains were produced in these alloys after previous transformation structure was removed. Seventeen β traces were analyzed by the single-surface method and 11 traces by the two-surface method. The habit plane of β in α Ti was determined to be close to [1450]. (auth)

3094

Carnegie Inst. of Tech.

THE EFFECTS OF GEOMETRY OF NOTCH AND SPEED OF TESTING ON THE FATIGUE PROPERTIES OF TITANIUM. J. P. Romualdi and E. D'Appolonia. Mar. 1953. 24p. (NP-4505; WAL-401/68-22)

The effect of geometry of notch on the fatigue properties of Ti alloy cold drawn and annealed (equal to RC-55) was studied on rotating beam machines. The complete reversal tests were conducted at speeds of 1800 and 10,000 rpm. Test data show the effect of heat generated during the test on the fatigue properties. Curves show the reduction in endurance limit with increase in theoretical stress-concentration factor. The notch sensitivity of the Ti alloy is presented in convenient form for design. (auth)

3095

Battelle Memorial Inst.

THE PLASTIC DEFORMATION OF SINGLE CRYSTALS OF ALUMINUM; SUMMARY REPORT. R. D. Johnson, A. P. Young, W. B. Wilson, and A. D. Schwope. Oct. 10, 1952. 61p. (NP-4506)

A portion of the work performed in a fundamental investigation of creep in metals is described. The creep of single crystals of high-purity (99.99+%) Al has been studied in the temperature range 700 to 1100°F. At the highest temperature, slip on the cubic plane, the high-temperature slip plane, was predominant. The results of this latter test at a low-resolved shear stress indicated that the critical-resolved shear stress had decreased considerably with increasing temperature. Experiments were carried out to investigate the effects of small amounts of prestraining by various methods on the creep properties of these Al single crystals. An experimental survey was conducted with various high-resolution x-ray-diffraction techniques to determine the feasibility of studying the nature of plastic deformation in this manner. An "oblique micro-slit" technique was employed to detect and to follow the strains resulting in different stages of a prestrain experiment. The electron microscope was utilized to observe the strain markings and other features of the deformation on a microscopic scale. Crystals deformed at room temperature and at elevated temperatures were examined by means of replica techniques with both plastic and oxide replicas. The deformation was found to be quite inhomogeneous at low strains, and to be dependent on the surface preparation employed. An electropolished surface which had been etched lightly was found to be most suitable for this type of replica work. (auth)

3096

Institute of Engineering Research, Univ. of Calif., Berkeley

THE EFFECT OF $CuAl_2$ DISPERSIONS ON THE FATIGUE OF ALUMINUM-COPPER ALLOYS. Robert B. Shaw. Apr. 1, 1953. 27p. (NP-4515; Technical Report 26)

The fatigue properties of Al-Cu alloys containing $CuAl_2$ dispersions were investigated at room temperature. In contrast to the well-known results on spheroidal steels, the fatigue properties were found to be practically independent of the degree of dispersion. An investigation into the nature of crack formation in these alloys revealed that nucleation of microcracks depends primarily on the critical resolved shear stress on slip planes. Final failure was attributed to the accumulation of microcracks in the grain boundary regions. (auth)

3097

Rutgers Univ. Coll. of Engineering

STUDY OF CRYSTAL IMPERFECTIONS OF POLYCRYSTALLINE MATERIALS, PART 3; TECHNICAL REPORT [FOR] JULY 1951–MARCH 1953. Sigmund Weissmann and Doris Evans. Mar. 6, 1953. 109p. (NP-4521; Technical Report 3)

The study of the mechanism of recovery and subgrain formation of polycrystalline Al and the study of lattice distortions occurring during age hardening of the Cu-1.9% Be system were carried out by means of the x-ray double-crystal spectrometer. This technique clearly reveals the subgrain domains and the fine mosaic structure of polycrystalline Al. For a 99.95% Al sample the misorientation of neighboring subgrain domains is statistically computed from intensity data and corresponding angular specimen settings. The early stages and the developement of a subgrain structure is shown to be a function of increasing annealing time. Specimens of annealed Cu-1.9% Be have been studied under various conditions of age hardening. A statistical method is given for evaluating, from the recorded photographic intensities, the instrumental variance of the double-crystal spectrometer and its associated x-ray source. A detailed report of a photometric detection technique for the rapid measurement of integrated x-ray-diffraction spots is

given. An account is given of the O.N.R. sponsored West-European trip made by Dr. S. Weissmann, which emphasized the research into the problems of crystal imperfections of metals and alloys. (For preceding report in series see NP-3150.) (J.S.R.)

3098

Horizons, Inc.

THE EXTRACTIVE METALLURGY OF ZIRCONIUM BY THE ELECTROLYSIS OF FUSED SALTS; FINAL REPORT. Morris A. Steinberg, Merle E. Sibert, Bertram C. Raynes, and Eugene Wainer. Feb. 15, 1953. 203p. (NYO-3121)

An intensive investigation of the production of Zr by the electrolysis of fused salt baths containing halides ($ZrCl_4$) and double halides (K_2ZrF_6) of Zr was undertaken. Special electrolytic cells, heated by carbon resistors and operating in an inert atmosphere of argon were designed and constructed for this work. Current and voltage controlling and recording equipment was designed and constructed so that accurate data could be obtained on the decomposition potentials of the halides utilized and the electrical characteristics of the many electrolytes investigated. A survey of over 80 bath compositions utilizing these two compounds has been carried out to determine a suitable electrolyte for Zr production. The conditions for the formation of diffusion plates of Zr, the recovery of Zr in liquid cathodes, and the cathodic production of Zr as a loosely-held, coarse, dendritic powder have been determined. A simplified fused salt bath containing 25 to 35% K_2ZrF_6 in NaCl has proven superior to other electrolytes for producing Zr. High current densities and temperatures of the order of 850 to 900°C yield the optimum results, producing coarsely granular Zr metal powder easily recoverable by a simple washing technique. At higher temperatures and lower current densities diffusion plates of Zr on various base metals can be obtained. (auth)

3099

Massachusetts Inst. of Tech.

STUDY OF METAL-CERAMIC INTERACTIONS AT ELEVATED TEMPERATURES; PROGRESS REPORT. F. H. Norton, W. D. Kingery, et al. Apr. 1, 1953. 6p. (NYO-3145)

The surface tensions of fused silica and liquid Cu have been measured by pendant-drop, fiber-extension, and sessile-drop methods. Conclusions reached in an investigation of the sintering mechanism in pure single-component systems are briefly reported. (For preceding period see NYO-3142; cf. NYO-3143 and 3144.) (L.M.T.)

3100

Massachusetts Inst. of Tech.

THE MEASUREMENT OF THERMAL CONDUCTIVITY OF REFRACTORY MATERIALS; PROGRESS REPORT. F. H. Norton, W. D. Kingery, et al. Apr. 1, 1953. 18p. (NYO-3644)

Additional experimental data for samples with controlled porosity in the form of cylindrical pores are presented. These data indicate good agreement with previous calculations regarding the effect of pore orientation. Samples of high and low emissivity are being prepared to investigate the radiation effect. Various additional materials, solid solutions, and crystal mixtures are being prepared and investigated. Conductivity data are reported for TiC and fused silica. Other carbides and glasses are being prepared. (For preceding period see NYO-3642; cf. NYO-3643.) (auth)

3101

Metals Research Lab., Carnegie Inst. of Tech.

ELECTROCHEMICAL STUDIES OF NON-AQUEOUS MELTS; QUARTERLY PROGRESS REPORT [FOR] PERIOD ENDING FEBRUARY 15, 1953. Robert F. Mehl and Gerhard Derge. Apr. 7, 1953. 12p. (NYO-3693)

Specific electric conductance measurements were made on the molten binary Cu_2S-CuCl. It was found that relatively small amounts of CuCl serve to greatly reduce the electronic conduction of Cu_2S. It was determined that practically all of the current in Fe-silicate slags is carried by the Fe ions. The decomposition potential of the LiCl-NaCl eutectic was measured and found to be 3.1 volts. (For preceding period see NYO-3692.) (L.M.T.)

3102

Oak Ridge National Lab.

CONE-ARC WELDING. P. Patriarca and G. M. Slaughter. Issued Apr. 10, 1953. 14p. (ORNL-1514)

A new, inert-gas-shielded, semiautomatic arc-welding process, known as the cone-arc process, is described and evaluated by experiment. The process utilizes standard welding equipment and is applicable to the reliable fabrication of the miniature tube-to-header type of heat exchangers. Experiments were conducted in which small-diameter, thin-walled, stainless-steel tubing was used with header sheets of sufficient thickness to ensure the production of consistently good welds. An investigation of the effects of arc current and welding time indicated that these variables were not critical and that, within liberal limits, precise control of the current and time was not necessary. After determination of proper welding conditions, weld penetrations of twice the tube-wall thickness could be obtained without excessive constriction of the internal diameter of the tube. A hole-to-hole distance, center to center, of twice the outside diameter of the tube was found to be desirable in preventing the overlap of fusion zones. (auth)

3103

New York Univ.

BINARY ALLOYS OF TITANIUM WITH CARBON, NITROGEN, OXYGEN AND BORON; FINAL REPORT. Irving Cadoff and A. E. Palty. Oct. 31, 1952. 108p. (WAL-401/14-30)

The phase diagrams of Ti-C, Ti-N, Ti-O, and Ti-B were completed in the composition range Ti to TiX. The experimental methods used in preparing and processing alloys were designed to minimize contamination. Metallography, x-ray diffraction, and melting range data were used in delineating the phase diagrams. Modifications of standard techniques for use with Ti alloys were developed. Lattice parameters of α phase alloys were measured. Mechanical properties of alloys in the ductile range are included. (auth)

3104

THE SOLUBILITY OF OXYGEN IN, AND THE OXIDES OF, TANTALUM. R. J. Wasilewski. J. Am. Chem. Soc. 75, 1001-2(1953) Feb. 20.

Solid solubility of O_2 in Ta and the possible existence of compounds between 0 and 18.11 wt.% O were studied by x-ray diffraction. A structure thought to be Ta_2O, having an orthorhombic cell with a = 5.29, b = 4.92, and c = 3.05 A, was found. Existence of the dioxide was not confirmed, the reported Ta_2O_4 appearing to be the mixture $Ta_2O{\cdot}3Ta_2O_5$. Reaction of Ta_2O_5 with Ta metal is very fast from 1700 to 2200°C, indicating rapid diffusion of O through the metal. (G.Y.)

3105

DEFORMATION BY REPEATED SHOCKS OF ANNEALED POLYCRYSTALLINE ALUMINUM. Yves Pironneau. Compt. rend. 236, 1231-4(1953) Mar. 23. (In French)

The results obtained confirm those found for Al-Cu single crystals (NSA 7-1999). In the first approximation, the deformation is proportional to the energy applied to the metal. The principle of superposition is verified. Evidence is presented for the existence of a transition point comparable to that found for traction curves. (tr-auth)

PHYSICS

3106
Ohio State Univ.
MAGNETIC SUSCEPTIBILITY OF COLORED POTASSIUM CHLORIDE FROM 1° K TO 300° K. C. V. Heer and C. Rauch. [1952]. 8p. (AECU-2466)

In order to study the nature of F-centers and other color centers formed in KCl additively colored with an excess of K, the temperature-dependent magnetic susceptibility of an additively colored crystal was measured between 1 and 300°K. The magnetic susceptibility of pure KCl between 1.5 and 300°K is temperature independent within experimental accuracy and yielded a value of $-0.49 \pm 0.01 \times 10^{-6}$ emu/g. The excess magnetic susceptibility of the colored KCl varies linearly with the reciprocal temperature at lower temperatures, and fits the equation $3 \times 10^{-8} + 1.36 \times 10^{-6}/T$ emu/cm^3. For a system composed of n magnetic spins per cm^3 with spin magnetic quantum number $\frac{1}{2}$ and obeying Boltzman statistics, the paramagnetic susceptibility is given by 6.18×10^{-25} n/T emu/cm^3. (L.M.T.)

3107
Argonne National Lab.
PHYSICS DIVISION QUARTERLY REPORT [FOR] MARCH, APRIL, AND MAY 1952. Jan. 1953. 58p. (ANL-4963)

Neutron resonances were measured for Zn, As, Cd, Xe, and Bi. Neutron transmission measurements were made for Sc, Li^7, Fe^{54}, Fe^{56}, Fe^{57}, and Fe. Average thermal neutron scattering cross sections of H bound in Zr were studied. Work continued on evaluation of various organic scintillators for neutron detection. The absorption cross section of D for 2000 m/sec neutrons was calculated to be 0.57 ± 0.01 mb from T formation in neutron irradiation of D_2O and Li. Capture γ-ray lines for K, Ca, Ti, V, Co, and Zn are listed. The decay scheme of Sc^{48} is discussed. Average charge on He^3, N^{14}, Rb, and Cs following β emission by T, C^{14}, and a mixture of Kr and Xe fission gases is described. The positive ion current of the charged daughter atoms is observed in gases of the parent at very low pressure. The number of electron units of charge collected by a probe in the unit time is compared with the disintegrations of the parent atom. Data are presented on an attempt to measure the average charge of 18-min Br^{80} daughters after isomeric transition of the 4.4-hr parent. The positive ion current generated by the decay of gaseous $C_2H_5Br^{80}$ at low pressure is compared with the disintegration rate of the gas. Deformability of the nuclear core from semi-empirical shell-model calculations is discussed. (For preceding report see ANL-4798.) (L.T.W.)

3108
Cryogenic Lab., Ohio State Univ.
THERMAL, STRUCTURAL, ELECTRICAL, MAGNETIC AND OTHER PHYSICAL PROPERTIES OF TITANIUM, ZIRCONIUM, HAFNIUM, AND THORIUM, AND SOME OF THEIR SIMPLE COMPOUNDS. 1. TITANIUM, ITS HYDRIDES, OXIDES, HALIDES, NITRIDE, CARBIDE, AND THE ALKALINE EARTH TITANATES. G. B. Skinner, C. W. Beckett, and H. L. Johnston. Jan. 1, 1950. 136p. (ATI-81816; Technical Report 102-AC49/2-100-1)

The literature on the preparation and properties of Ti, its hydrides, oxides, halides, nitride, and carbide, and the alkaline earth titanates, has been reviewed. Information has been reported on methods of preparation, crystal structure, density, transitions between forms, thermal functions, heat of formation, thermal expansion, dielectric constant, and other properties. In many instances, the information is incomplete or unreliable. An attempt has been made to correlate and evaluate the data of the different experimenters. In addition, calculation of equilibrium conditions have been made for a number of reactions involving Ti and its compounds. A bibliography of about 500 references has been included. (auth)

3109
General Engineering Lab., General Electric Co.
THERMAL STRESSES IN CYLINDERS. H. Poritsky and M. F. Bolster. May 20, 1952. 42p. (DF-52GL128)

General thermal elastic equations are presented both in rectangular and cylindrical coordinates. Maximum stress estimates are obtained from these equations and an analogy to mechanical body forces is obtained. Expressions are given and curves are plotted for the stresses in cylinders of infinite and finite heights, due to a parabolic temperature distribution. The stresses are found as a sum of the stresses in an infinitely long cylinder and additional stresses due to end effects. The latter die out so as to become negligible at a distance from the end approximately equal to the diameter. Thus, in a cylinder whose height is greater than its diameter each of the two end effects may be treated independently. The "end-effect" stresses are obtained from two terms of an infinite series expression, so a slight discrepancy from the actual stresses are observed at the ends. (auth)

3110
Radiation Lab., Univ. of Calif., Berkeley
SUMMARY OF RESEARCH PROGRESS MEETING OF NOVEMBER 20, 1952. Sergey Shewchuck. Dec. 30, 1952. 8p. (UCRL-2065)

Preparation and Composition of TbF_4. D. C. Feay. TbF_4 and CeF_4 were prepared by the reaction of elementary F with TbF_3 and CeF_3. TbF_4 and CeF_4 are monoclinic with the ZrF_4 structure and are isomorphous with the actinide tetrafluorides. The lattice constants a, b, c, and β of CeF_4 are12.6 A, 10.6 A, 8.3 A, and 126°, respectively. For TbF_4 they are 12.1 A, 10.3 A, 7.9 A, and 126°, respectively. Study of Triton Production in d-d Collisions. C. S. Godfrey. The cross-section angular distribution for the reaction $d + d \rightarrow H^3 + p$ using 190-Mev deuterons is shown. The tritons ranged from ~170 Mev at 5° to 100 Mev at 30°. CD_2, CH_2, and C were used as targets. Data were obtained for 45, 60, and 90° (c.m.). (L.T.W.)

3111
LOW ANGLE X-RAY DIFFRACTION WITH LONG WAVELENGTHS. Burton Henke and Jesse W. M. DuMond. Phys. Rev. 89, 1300(1953) Mar. 15.

The advantages of using long wavelengths in the investigation of submicroscopic structures by low-angle diffraction methods are outlined. Very little work has been done on the long wavelength region, however, possibly because of the necessity of working in vacuum and with very low x-ray production efficiencies. A new type of diffraction unit that has been designed to meet these problems is described. The unit is designed to operate at such wavelengths as Cr K, Al K, Cu L, O K, and C K lines (2.3, 8.3, 13.3, 23.6, and 44.5 A, respectively). The central feature of the instrument is a nearly cylindrical, totally reflecting mirror, ground and polished into an ellipsoidal section from pyrex, which forms a point-focused image of the source. A low-angle photograph is shown of a Dow Latex sample taken with Cu L 13.3 A radiation. (L.M.T.)

3112
SOUND IN SOLUTIONS OF FOREIGN PARTICLES IN HELIUM II AND DISSIPATIVE FUNCTION OF SOLUTIONS. I. M. Khalatnikov. Zhur. Eksptl'. i Teoret. Fiz. 23, 265-74(1952) Sept. (In Russian)

3113
DISCONTINUITIES AND HIGH-AMPLITUDE SOUND IN HELIUM II. I. M. Khalatnikov. Zhur. Eksptl'. i Teoret. Fiz. 23, 253-64(1952) Sept. (In Russian)

3114
HYDRODYNAMICS OF SOLUTIONS OF FOREIGN PARTICLES IN HELIUM II. I. M. Khalatnikov. Zhur. Eksptl'. i Teoret. Fiz. 23, 169-81(1952) Aug. (In Russian)

3115
OPTICALLY INDUCED NUCLEAR MAGNETIZATION. A PROGRESS REPORT. F. Bitter, R. F. Lacey, and B. Richter. Revs. Mod. Phys. 25, 174-7(1953) Jan. (cf. NSA 6-3060)

Following a suggestion by A. Kastler (J. phys. radium 11, 255(1950)) an attempt has been made to produce a high degree of nuclear orientation in Hg^{199} vapor by the absorption of circularly polarized resonance radiation. A method is described for detecting the nuclear orientation by observing the intensity of the π component of the resonance radiation. No indication of orientation was found. The probable cause for this failure is considered to be the imprisonment and consequent depolarization of the effective component of the resonance radiation. (auth)

3116
THE EXISTENCE OF POSITRONIUM CHLORIDE. Lennart Simons. Phys. Rev. 90, 165-6(1953) Apr. 1.

Of the two combinations $(Cle^-)e^+$ and $Cl(e^-e^+)$ which suggest themselves when positrons pass through Cl_2 gas, the first was treated mathematically (Soc. Scient. Fennica Commentationes Phys.-Math. 14, 9(1949)) for the quantum number l = 0. The computations have been extended to the whole spectrum. In addition, the probability of the transformation of the system $(Cle^-)e^+$ to $Cl(e^-e^+)$ is considered. (L.M.T.)

COSMIC RADIATION

3117
Rochester Univ.
HIGH ENERGY NUCLEAR INTERACTIONS IN LEAD AND LIGHT ELEMENTS. M. F. Kaplon, D. M. Ritson, and W. D. Walker. Mar. 31, 1953. 7p. (NP-4504)

To obtain more information on high-energy nuclear interactions in the 10^{12}- to 10^{14}-ev region, a "block" of emulsion consisting of 92 G5 emulsions was placed on top of an emulsion cloud chamber of 25 alternate 3-mm Pb plates and 250-μ G5 emulsions and flown for 6 hours at White Sands. The multiplicity observed on the plate directly below the Pb absorber in which the interaction occurred is plotted against the distance back to the point of interaction. The line of the graph which appears to represent the data is calculated assuming an initial production of 20 charged particles and 10 π^0 mesons decaying into two photons with a lab. lifetime $< 3 \times 10^{-2}$ sec. The calculated line seems to fit the data well. Seven primary interactions were found and data are given for N_s, the no. of minimum ionizing particles, and N_h, the no. of gray plus black prongs occurring in the interaction. The multiplicity appeared to be independent of N_h, with an average value of ~16. (L.M.T.)

3118
National Research Council of Canada
OBSERVATIONS OF ATMOSPHERIC SHOWERS OF COSMIC RAYS WIDER THAN 1000 M. G. T. Zatsepin, I. L. Rosental, V. P. Zakharova, N. G. Khrebet, and G. B. Khristiansen. Translated by G. Belkov from Doklady Akad. Nauk S. S. S. R. 74, 29-32(1950). 10p. (AEC-TR-1511; TT-359)

Groups of counters were arranged at 3860 m elevation in such a geometry that they would detect twofold and threefold cosmic-ray coincidences. The substantial difference between the amplitude of the impulse caused by the twofold coincidence and that of the threefold coincidence made it possible to register fourfold and sixfold coincidences simultaneously. The number of coincidences registered are tabulated. (L.T.W.)

3119
COLLISION CROSS SECTIONS IN PENETRATING COSMIC RAY SHOWERS. Kurt Sitte. Acta Phys. Austriaca 6, 167-80 (1952) Nov. (In German)

Contradictions in the determination, by different methods, of cross sections for high-energy nuclear collisions are discussed. While the results of counter-tube experiments indicate an increase in collision length with decreasing primary energy, experiments with cloud chambers or emulsions, even for energies below 10^9 ev, require, at least for heavy elements, a "geometrical" cross section. On the basis of new experimental results it is shown that the source of this conflict lies in an error in the value obtained with counter-tube arrangements. If this effect is calculated, satisfactory agreement of all results with the assumption of a geometrical cross section is found for all energies above $\sim 0.75 \times 10^9$ ev. Similarly, the often observed "transparency" of light nuclei in this energy region is to be attributed partially or entirely to the inadequacy of the research method. (tr-auth)

3120
THE ENERGY SPECTRUM OF THE SOFT COMPONENT OF COSMIC RADIATION. J. Clay. Physica 19, 51-60(1953) Jan.-Feb.

The absorption of the soft (electron) component of cosmic radiation was measured in Pb, Fe, and Al with the aid of Scheen's range-energy relation for these materials. For the differential energy spectrum of the form $N = N_0 E^{-S} dE$, S was calculated for $E < 10^8$ ev and found to be 1.58 for Al, 1.56 for Fe, and 1.50 for Pb. The value for Pb is in perfect agreement with earlier measurements by another method. The absorption spectrum of particles produced in Pb, Fe, Al, and paraffin was also investigated, and the energy in these cases calculated. Here the presence was noted of electrons with higher energies than those of the soft radiation in the atmosphere. On account of the small absorption of the producing particles in the producing layers, the most acceptable conjecture seems to be that this production is caused by high-energy photons. (auth)

3121
KINETIC PROPERTIES OF INTERSTELLAR GAS IN RELATION TO ISOTROPIC COSMIC RAYS. S. B. Pikel'ner. Doklady Adad. Nauk S.S.S.R. 88, 229-32(1953) Jan. 11. (In Russian)

3122
A SEARCH FOR PENETRATING SHOWERS FROM HYDROGEN AT SEA LEVEL USING A CLOUD CHAMBER. Albert B. Weaver. Phys. Rev. 90, 86-94(1953) April 1.

The extent to which multiple production of π mesons takes place in local sea-level penetrating showers was studied with a counter-controlled cloud chamber in a magnetic field. The rates at which penetrating showers occur under C, Al, and Pb were determined and a search was made for them under liquid H. In a total operating time of 626 hours with an average thickness of 2.28 g/cm^2 of liquid H above the chamber, no penetrating showers were found which could have originated in the H. On the basis of the rates at which such showers occur in heavier materials and the number of them formed in the material of the Dewar while operating with H, one would have expected to detect a minimum of 6 showers from the H if the cross section for the production of penetrating showers were the geometric area of the nucleus (taken as 6×10^{-26} cm^2 for H). It can then be concluded that the majority of sea-level local penetrating showers detected below heavy materials by an apparatus of this kind can be attributed mainly to plural production. From momentum measurements in the magnetic field, the minimum value which can be assigned to the momentum of the incident nucleons which causes the average penetrating shower detected with this apparatus was estimated at 6

bev/c. It follows that the multiple production of charged mesons in a single nucleon-proton collision at about 6 bev probably does not occur in more than 15% of the cases. The ratios of the rates at which penetrating showers were detected under C, Al, and Pb were proportional to the geometric area of the nuclei within statistical limits. An event found in the H which is very similar in appearance to the μ-meson interaction first observed by Braddick and Hensby is discussed. A photograph of a nuclear collision in Pb is described in which very little energy is transferred to the Pb nucleus although the incident particle has a momentum estimated to be 40 bev/c. 33 references. (auth)

3123

COSMIC-RAY NEUTRON PRODUCTION IN ELEMENTS AS A FUNCTION OF LATITUDE AND ALTITUDE. J. A. Simpson and R. B. Uretz. Phys. Rev. 90, 44-50(1953) April 1.

The relative rates of local neutron production in Al, Cu, Sn, and Pb were obtained at geomagnetic latitudes $\lambda = 40$ and 54° at atmospheric depth 312 g/cm^2 (30,000 ft pressure altitude). The latitude and altitude dependence of local neutron production in C and Pb were measured in the latitude interval 0 to 54° with a pile geometries containing BF_3 proportional counters. From these observations several results were obtained: (1) the relative neutron multiplicities in elements were measured and found to be in good agreement with reported low-altitude observations; (2) a neutron transition maximum in Pb at ~20 g/cm^{-2} Pb was obtained at 33,000 ft pressure altitude; (3) the absorption mean free path for the neutron-producing radiation in Pb was 350 g/cm^2; (4) an anomalous air-absorption mean free path for the nucleonic component has been found for measurements derived from local neutron production in Pb at $\lambda \geq 40°$; (5) aside from the absorption anomaly in elements of high atomic weight A, local neutron production in elements of high A as a function of λ is in fair agreement with the free-air neutron-latitude effect; and (6) local production in C as a function of λ and altitude is in agreement with corresponding free-air neutron measurements. (auth)

3124

METEORITES AS COSMIC-RAY METERS. S. F. Singer. Phys. Rev. 90, 168(1953) Apr. 1.

It has been established by the author and other investigators that the He^3 (produced from β decay of H^3) in Fe meteorites can be used as a kind of cosmic-ray meter which integrates the cosmic-ray flux it encounters from the time of its exposure to the time of its fall on earth, and with certain assumptions information can be gained about the prehistoric cosmic-ray intensity. This note considers the possibility of using a radioactive species produced by cosmic rays as an indicator of the present cosmic-ray intensity existing in the region from which the meteorite came. In a freshly fallen meteorite the H^3 activity should be detectable (~0.01 cps), decreasing only ~5.8% per year. The cosmic-ray intensity experienced by the meteorite in the years immediately preceding its fall would differ from the intensity near the earth by this amount. In addition to calculating the activity expected it could be calibrated to the intensity near the earth, since with successive flights in high-altitude balloons an exposure of 0.1 year can be obtained for 10^3 g of Fe which would yield ~2.5×10^7 atoms of cosmic-ray-produced H^3. (L.M.T.)

3125

ADDITIONAL MEASUREMENTS ON THE SHOWER-PRODUCTION CURVE. H. Thurn. Z. Naturforsch. a8, 134-7 (1953) Feb.-Mar. (In German)

In continuation of earlier experiments it has been established that the permanent third maximum as well as the air-pressure-dependent fourth maximum of the Rossi curve originates from nonionizing shower-producing radiation. The dependence of the Rossi curve on the distance between the Pb radiator and the counter tubes also has been investigated. Finally, the curve has been determined for iron and graphite radiators. (tr-auth)

3126

ALTITUDE DEPENDENCE OF THE STAR-MAGNITUDE DISTRIBUTION AND ENERGY SPECTRUM OF THE NUCLEON COMPONENT AT $\lambda = 50°$N. M. Teucher. Z. Naturforsch. a8, 127-34(1953) Feb.-Mar. (In German)

Information on the change in energy distribution of the star-producing radiation at 150, 3774, and ~20,000 m altitude has been sought by comparison of the star-magnitude diagrams at these levels. It was shown that at energies $>10^9$ ev, the star-magnitude distribution is little suitable for this purpose, the shower-magnitude distribution giving a better reproduction of the primary energy spectrum. The results so obtained, however, deviate very greatly from the measurements of the primary spectrum at the top of the atmosphere. This discrepancy must be related to the increase in mean energy per shower particle with increasing energy and also to the increase in the inelasticity of the process. (tr-auth)

3127

AUGER SHOWERS IN THE ATMOSPHERE. Alice Daudin and Jean Daudin. J. phys. radium 14, 169-74(1953) Mar. (In French)

Extensive Auger showers of 5 and 80 m extent have been studied for 2 yr at 2860 m altitude (Pic du Midi). The great variations in background diminished the advantages of high counting speed; the authors were equally hindered by the resistance of the glass in the counters at low temperatures. Barometric effects of -10.6 ± 0.2 and -10.4 ± 0.16%, almost identical, were found at 5 and 80 m (2×10^7 and 3×10^6 coincidences). At 5 m, a temperature effect of -0.1%/°C resulted from a purely geometric effect of density previously predicted by the authors. This density effect may have a considerable influence over large distances (>100 m) and at high densities observed with ionization chambers. A correlation of 0.35 exists between two daily registrations of extensive air showers during the winter, which may be attributed to an unknown physical effect having a mean daily amplitude of the order of 0.7%/day. An effect >1%/day in winter, i.e., one-sixth of the barometric effect, appears excluded. The absorption of Auger showers seems to diminish between 3000 m and sea level, testifying to a redistribution of the various components to the detriment of nucleons and electrons and to the advantage of μ mesons. (tr-auth)

3128

ELECTRONIC COMPONENT OF ATMOSPHERIC COSMIC RAYS DERIVED FROM THE NEUTRAL-MESON DECAY. D. Cadorin. Nuovo cimento (9) 10, 364-79(1953) Apr. 1. (In Italian)

The contribution from the π^0 meson decay into two photons to the electronic component of the cosmic radiation, in passing through the atmosphere, is calculated; the diffusion equations are used with a generating function for the photons whose energy dependence is taken from the experimental data of the Bristol group, and whose variation with the altitude is derived from an absorption length of 130 g/cm^2. The diffusion equations are integrated by a method of successive approximations, taking into account both the ionization energy loss and the variation of the cross sections for pairs and bremsstrahlung with energy. The results are normalized on the integral spectra of the total electronic component taken from the more recent experimental data, and a ratio $\pi^0/\pi^\pm = 0.53$ of neutral to charged mesons is obtained. The absolute values of the intensity obtained in this way are not inconsistent with those given

by the Bristol group, within the wide limits of the uncertainties actually existing regarding some processes used in the comparison. (auth)

3129

ZENITHAL DEPENDENCE OF THE PENETRATING COMPONENT OF COSMIC RADIATION. I. F. Quercia and B. Rispoli. Nuovo cimento (9) 10, 357-63(1953) Apr. 1. (In English)

Two experiments are reported, one performed at Cervinia, Italy (3500 m) and one performed at Rome, on the zenithal distribution of penetrating particles and mesons. It is found that the penetrating component at sea level can be represented by the law $I(\theta) = I_0 \cos^n \theta$ with n = 2.14 for E = 500 Mev whereas at 3500 m the distribution does not obey the law. At sea level, moreover, the mesonic component with energy between 0.5 and 1.9 bev follows very closely the law $\cos^{3.06}\theta$. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

3130

[Massachusetts Inst. of Tech.]

PLASTIC BENDING OF ZINC CRYSTALS. G. P. Conard, II, B. L. Averbach, and Morris Cohen. 1952. 9p. (NYO-3818)

Single Zn-crystal specimens of 3.2 mm diam. were bent on templates to effective radii varying from 14.2 to 1.3 cm, at temperatures from –196 to 100°C, the axis of bending being parallel to the basal plane in each case. Subsequent annealing was carried out at temperatures from –196 to 400°C. Back-reflection Laue pictures were taken on the curvex surface of the bent specimens before and after annealing. Some x-ray pictures of rods bent at –196 and 78°C were taken at these temperatures without warming to room temp. In addition, bent crystals were acid-cut parallel to the basal plane; double-crystal spectrometer rocking curves were obtained from the etched face before and after increment anneals up to 60 hours at 400°C, and Laue back-reflection pictures were taken. The results demonstrate that Zn crystals do not undergo uniform bending, but deform in a heterogeneous manner on a fine scale to produce slightly disoriented lattice segments or subgrains separated by boundaries in which most of the bending is concentrated. (L.M.T.)

3131

NEUTRON DIFFRACTION STUDIES OF VARIOUS TRANSITION ELEMENTS. C. G. Shull and M. K. Wilkinson. Revs. Mod. Phys. 25, 100-7(1953) Jan. (cf. NSA 6-3674)

Neutron-diffraction measurements are reported on a series of transition elements as an investigation into their magnetic structures. Scattering data have been taken for W, Mo, Nb, V, Cr, Mn, and Fe at various temperatures as low as 4.2°K, and these data are interpreted in terms of the magnetic structure existing in the pure metals. For the first four elements, no magnetic scattering, either coherent or incoherent, is found. Cr and α-Mn are established as being antiferromagnetic with Néel temperatures of 475°K and 100°K, respectively. Paramagnetic scattering has been observed in Mn at room temp., and the atomic moments determined for Cr and Mn follow the general trend of the Slater-Pauling curve. Magnetic-superstructure effects and magnetic-disorder scattering were looked for in Fe and neither was found. (auth)

3132

A THEORETICAL EXAMINATION OF THE PLASTIC DEFORMATION OF CRYSTALS BY GLIDE. J. F. W. Bishop. Phil. Mag. (7) 44, 51-64(1953) Jan.

Proofs are given of theorems stated in the Bishop-Hill theory of crystal distortion. Mathematical relations are established for the deformation of crystals by simultaneous shears, and the possibility of enforcing an arbitrary strain by glide is examined. The uniform stress states not exceeding the critical shear stresses in the glide directions are discussed, and a geometrical picture of stress and strain states is developed. It is proved that it is always physically possible to enforce a given strain by glide provided it is geometrically possible. The uniform elongation of a fcc crystal is examined. (auth)

ELECTRICAL DISCHARGE

3133

HIGH FREQUENCY OSCILLATIONS IN ELECTRON PLASMA. A. I. Akhiezer and I. B. Feinberg. Translated by J. I. Pankove from Zhur. Eksptl'. i Teoret. Fiz. 21, 1262-9(1951). 12p. (AEC-TR-1512)

The interaction of a cluster of charged particles with an electron plasma is examined. It is shown that the state of the cluster, which is characterized by constant and uniform velocity and density, appears unstable. If such a cluster enters a plasma, then fluctuation of density and velocity originating in it propagate in the form of a wave with increasing amplitude. Combined with this, a longitudinal electric field has similarly the character of a wave with growing amplitude. (auth)

3134

PASSAGE OF A CHARGED PARTICLE THROUGH AN ELECTRON PLASMA. A. I. Akhiezer and A. G. Sitenko. Zhur. Eksptl'. i Teoret. Fiz. 23, 161-8(1952) Aug. (In Russian)

The kinetic theory of interaction of a charged particle moving in an electron plasma is studied. (tr-auth)

GASES

3135

RAND Corp.

THE VISCOSITY OF POLAR GASES. F. J. Krieger. July 1, 1951. 23p. (RM-646(RAND))

Chapman and Cowling have related the coefficients of viscosity, diffusion, thermal diffusion, and thermal conductivity to a set of integrals $\Omega_n^{(l)}$ (T) involving the law of force between pairs of molecules. In this report the integral for l = 2, n = 2 has been evaluated, assuming that polar molecules interact according to an intermolecular potential field of the form

$$E(r) = 4\epsilon[(r_0/r)^{12} - (r_0/r)^6 - \delta(r_0/r)^3]$$

where r is the separation between the molecules, ϵ is the maximum energy of attraction, r_0 is the low-velocity collision diameter, and δ is the reduced dipole energy. The molecular constants, ϵ, r_0 and δ have been determined for several polar molecules from existing experimental low-temperature viscosity data. Viscosities have been computed for these species over a temperature range from 298.16 to 3000°K and at a nominal pressure of 1 atm. (auth)

INSTRUMENTS

3136

Atomic Energy Research Establishment, Harwell, Berks (England)

A FULL RADIATION PYROMETER SUITABLE FOR TEMPERATURE MEASUREMENTS IN THE RANGE 0° TO 100°C. M. G. Davies and H. Kronberger. Sept. 21, 1951. 7p. (AERE-G/M-144)

A full-radiation pyrometer is described having in vacuo an accuracy of ½° at 70°C. The action depends on a thermal null method. Readings are, therefore, independent of the emissitivity of the surface. A radiation receiver looks at the surface to be measured and at a wall of adjustable temp., settling at a value between them. Adjusting the wall temp. to equal the receiver temp. gives the surface temp. (J.E.D.)

3137
Purdue Univ.
DESIGN OF EXTENSOMETER FOR CREEP STUDIES: SPECIAL PROGRESS REPORT. Ben R. Gossick. Feb. 1, 1953. 14p. (COO-103)

An extensometer was designed for studying the plastic flow of materials under stress, and at the same time under deuteron bombardment. The extensometer incorporates automatic and remote operation for irradiation studies over a wide range of extension (10 to 10^{-3}%). Remote operation was a necessary feature because of the radiation health hazard in the region of the test. Deformation of a creep specimen, which is mechanically coupled to a metal core within a mutual inductance bridge, determines the position of the core and thus the amount of bridge unbalance. The creep rate is indicated on a recording milliammeter connected to the electronically amplified and rectified output of the bridge. Calibration of the instrument is made by comparing readings on a low sensitivity scale with those on a traveling microscope. (auth)

3138
Los Alamos Scientific Lab.
THE MODEL 500 PULSER. O. L. Stone. Jan. 1953. 29p. (LA-1330)

The Model 500 pulser was designed primarily for calibrating pulse-height analyzers. It can deliver to 93 ohms a pulse which is variable in amplitude from 0 to 100 v and of either polarity. Accuracy of a selected pulse amplitude is believed to be better than 1%. The pulse is formed by discharging a capacitor through a resistance-capacitance network. This capacitor is switched between the charging source and the pulse-forming network by a Hg relay. It is believed that circuit behavior can be calculated with good accuracy since the Hg relay approximates an ideal switch and the circuit consists of linear passive elements, except for the power supply. Close tolerances can be held without difficulty on circuit components, but the Hg relays must be selected. (auth)

3139
National Bureau of Standards
CATHODE-RAY-OSCILLOGRAPH BEAM INTENSIFICATION. John H. Park and H. N. Cones. Feb. 1953. 20p. (NBS-2281)

A method has been developed for momentarily intensifying the electron beam obtained from a cold-cathode discharge tube. This momentary intensification is about 50 times its steady-state value. This intensification phenomena is not dependent to any great extent on the gas used in the discharge tube. The material surrounding the discharge at and near the cathode must be a dielectric such as glass and not a conductor if intensification by superposed small pulses is to be obtained. When full voltage is suddenly applied to the discharge tube an intensified beam is obtained at times, but results are usually not repeatable. A satisfactory theoretical explanation for this beam intensification phenomena was not obtained. Such an explanation will probably not be attained until the steady-state mechanism of the discharge in a high-voltage cold-cathode tube is completely understood. Although such discharge tubes have been in use for over 30 yr there is still no experimentally verified theory for explaining their behavior. Continued studies of exactly what happens when full voltage is suddenly applied to the electrodes might eventually yield a satisfactory theory. The most important objective of this work, to learn enough about the intensification phenomena so that it could be used to obtain very high writing speeds with the CRO, has been achieved. The CRO, with intensification, has already been used in an investigation of insulator puncture using surges with rates of voltage rise up to 11,000 kv/μsec. It is now being used to study front-of-wave measurements on rapidly rising voltage surges. (auth)

3140
Radiation Physics Lab., National Bureau of Standards
VOLTAGE SUPPLIES USED IN THE RADIATION PHYSICS LABORATORY. Louis Costrell. Mar. 6, 1953. 11p. (NBS-2330)

The circuit diagrams and characteristics of three types of voltage supplies in use at the Radiation Physics Lab. are presented. These are a 500- to 1800-v supply for use with scintillation counters, a 1- to 4-kv supply for use with proportional counters, and a 0- to 500-v supply for checking the voltage sensitivity of rate meters. (L.M.T.)

3141
Oak Ridge National Lab.
INSTRUMENT RESEARCH AND DEVELOPMENT QUARTERLY PROGRESS REPORT FOR PERIOD ENDING JANUARY 20, 1953. Issued Apr. 7, 1953. 35p. (ORNL-1492)

Evaluation studies are reported on a new-type multichannel pulse analyzer; count-rate meter as a storage element for multichannel analyzers; circuit changes in scintillation spectrometer; regulated negative high-voltage power supply; development of an automatically recording, internal-standard, flame photometer; revision of gating circuit of automatic titrator and a high-sensitivity polarograph, analytical applications of high-frequency oscillators; microelectrode assembly for pH measurements; counting response of crystal spectrometer; stabilization of mass-analyzer magnet supply; magnet control; quantatron; remote pipette control; pneumatic wave generator; liquid-metals circulator; testing panels for measurement control of time, temperature, pressure and electricity; instrumentation for gaseous radiation studies; cryostat controller; H-O gas detector; and control valve for low flow coefficient. The preceding report of this series is ORNL-1436. (J.E.D.)

3142
Radiation Lab., Univ. of Calif., Berkeley
RECORDING PULSE HEIGHT ANALYZER. William Goldsworthy. Jan. 27, 1953. 18p. (UCRL-2083)

A graph-plotting pulse height analyzer of compact size and moderate cost is described. Typical spectrograms are included. (L.M.T.)

3143
A TIME SELECTOR INTENDED FOR NEUTRON TIME-OF-FLIGHT MEASUREMENTS. P. Desneiges. J. phys. radium 14, 212-13(1953) Mar. (In French)

A timing circuit to measure the time of flight of slow neutrons is described. (G.Y.)

3144
PREPARATION OF SEVERAL SOLID ION SOURCES IN INDUCTION AND SOLAR FURNACES. Georges Couchet. Compt. rend. 236, 1240-2(1953) Mar. 21. (In French)

Preparation of solid thermionic sources having an alkaline aluminosilicate base and adaptable to optical polishing is described. (G.Y.)

3145
HELMHOLTZ COILS FOR PRODUCTION OF POWERFUL AND UNIFORM FIELDS AND GRADIENTS. S. T. Lin, and A. R. Kaufmann. Revs. Mod. Phys. 25, 182-90(1953) Jan.

A solenoid designed for precise magnetic susceptibility determinations on metals and alloys over a wide range of temperature is an air-core and water-cooled massive Helmholtz type with rectangular cross section. It consists of a field coil 10 cm in mean radius which can produce 35000 oersteds at a power of 1700 kw with a uniformity of about 10 ppm at the center within a region of 10% of the mean radius, and a gradient coil 5.2 cm in mean radius which can produce a gradient of 100 oersteds/cm at a power

of 2.5 kw with a uniformity of about 140 ppm within the same region. The fields and gradients are separately controlled. (auth)

ISOTOPES

3146

Atomic Energy Research Establishment, Harwell, Berks (England)

PRODUCTION OF ^{131}I FROM PILE-IRRADIATED TELLURIUM. B. J. Miles, C. W. Fletcher, R. A. Faires, B. R. Payne, and F. Hudswell. Oct. 10, 1952. 15p. (AERE-I/R-1038)

The present method of production of I^{131} from pile-irradiated Te is described in full detail. Various remote-control improvements have been installed and the apparatus has been made compact. The rate of production has been increased, and it is now possible to process 20 cans of Te per week; at the present pile power, this means that 10 to 11 curies of I (calculated back to pile shut-down) is the weekly attainable rate with two operators. The methods of checking the purity and strength of the product are also described. An appendix presents a procedure for the determination of small amounts of I in Te. (auth)

ISOTOPE SEPARATION

3147

Carbide and Carbon Chemicals Co. (K-25)

SEPARATION OF ISOTOPES BY MASS DIFFUSION—UNEQUAL DIFFUSION COEFFICIENTS. J. J. Keyes, Jr. July 30, 1952. Decl. with deletions Apr. 6, 1953. 18p. (AECD-3518; KLI-1575)

Equations for the determination of the stage enrichment factor and the screen area for the ideal of zero back pressure are derived. The equations are valid only for small concentrations of one of the isotopes. A comparison is made with the theory of Benedict (Chem. Eng. Prog. 47, 51-62, 111-22(1951)), and recommendations are given for application of his results for non-zero back pressure. (J.S.R.)

3148

Technical Information Service, AEC

ISOTOPE SEPARATION AND ISOTOPE EXCHANGE; A BIBLIOGRAPHY OF UNCLASSIFIED LITERATURE. G. M. Begun, Oak Ridge National Lab. and Robert E. Allen, Technical Information Service, AEC, comps. Jan. 23, 1953. 82p. (TID-3036)

A total of 785 references are compiled from the open literature on isotope separation and exchange. (J.S.R.)

MASS SPECTROGRAPHY

3149

A NEW MASS SPECTROGRAPH WITH ANASTIGMATIC FOCUSING. Richard F. K. Herzog. Z. Naturforsch. a8, 191-7(1953) Feb.-Mar. (In German)

A mass spectrograph, the deflecting fields of which have the focusing properties of spherical lenses, is described. The electrical field of a spherical condenser as well as a homogeneous magnetic field which the beam enters obliquely have this property. The new apparatus is distinguished in that all points on the photographic plate are obtained by spatial directional focusing in addition to velocity focusing. This improved directional focusing results in all rays from a point of the object image being finally concentrated in a point, whereas in the usual mass spectrograph they are distributed along a line. The sensitivity is thereby considerably increased in detecting valuable, rare isotopes or in investigating the purity of chemicals. Photographs obtained with the new instrument show that, by careful adjustment, the actual image sharpness predicted by electron-optical calculations can be attained. In studies with thermal ion sources a great number of extraneous ions were detected, a consequence of the increased sensitivity. (tr-auth)

3150

INVESTIGATION WITH A MOMENTUM MASS SPECTROMETER. Michael J. Higatsberger. Z. Naturforsch. a8, 206-11(1953) Mar. (In German)

In an earlier article (NSA 5-3467) a mass spectrometer was described with which the influence of magnetic and electrical fields on a particle could be avoided. The theory of the instrument was confirmed within the limits of experimental error. The electrical charge phenomena was investigated further on a nonconductor (photographic material) and a method of avoiding this effect was pointed out. An absolute mass determination of the alkali metals Li, Na, and K was carried out. Slow ions, which did not register on the photographic plates, were made visible by means of secondary electrons. The short beam path of this spectrograph permits mass determinations of short-lived isotopes. (tr-auth)

MATHEMATICS

3151

Atomic Energy Research Establishment, Harwell, Berks (England)

THE HARWELL COMPUTER. E. H. Cooke-Yarborough. Mar. 3, 1953. 5p. (AERE-EL/M-78)

The paper reviews the reasons for the rather unusual design of the Harwell computer and shows the effect of this design on its characteristics. The computer has been in regular use for 9 months; the serviceability during this period is discussed. The results are encouraging, and the computer is frequently run unattended overnight and over week ends. (auth)

3152

Reeves Instrument Corp.

SIMULATION AND COMPUTING TECHNIQUES, PART 2; SYMPOSIUM 2 [HELD IN] NEW YORK CITY, APRIL 28-MAY 2, 1952. 253p. (NP-4511)

The scope of the symposium included the general field of mathematical and physical simulation; significant advances in analog-computer design, techniques, and applications; methods for improving the accuracy of analog solutions; and role of the digital computer in simulation and as a tool for checking analog solutions. Papers are included on the following subjects: REAC solution of problems in structural dynamics; the use of an analog computer and feedback theory for the solution of structural problems in the static case; application of the electronic differential analyzer to eigenvalue problems; some REAC techniques employed at the David Taylor model basin; simulation studies of a relay servomechanism; use of the REAC as a curve-fitting device; precision in high-speed electronic differential analyzers; an application of analog computers to problems of statistical analysis; solution of linear differential equations with time-varying coefficients by the electronic differential analyzer; JAINCOMP computers and their application to simulation problems; the decimal digital differential analyzer CRC-105 as a tool for simulation and checking analog computer solutions; problems encountered in the operation of the M.I.T. flight simulator; automatic REAC operation for statistical studies; mathematical error analysis for continuous computers; checking analog computer solutions; analog computation of blade designs; solutions of partial integral-differential equations of electron dynamics using analog computers with storage devices; modifications and additions to the REAC; REAC servo response; application of differential relays to solution of REAC problems; techniques applied to the design and test of linear filters; the role of diodes in

an electronic differential analyzer; a high-accuracy time division multiplier; and an am-fm electronic analog multiplier. (G.Y.)

3153

Forrestal Research Center, Princeton Univ.

SOME PROPERTIES OF ROTATIONAL TRANSFORMS. Martin D. Kruskal. Feb. 18, 1952. 21p. (NYO-998; PM-S-5)

The behavior of the solutions of certain systems of difference equations is discussed, and the extent of the periodicity of the equations is considered. Infinitely differentiable 2-dimensional vector functions $U^{(i)}(X)$, $i = 0, 1, 2\ldots$, of the 2-dimensional vector X, such that $\sum_i g^i U^{(i)}(X)$ converges for all X, for g sufficiently small, are considered. The two systems discussed include

$$(1/g)(X_{n+1} - X_n) = \sum_i g^i U^{(i)} X_n \text{ and}$$

$$(1/g)(X_{n+1} - X_n) = \sum_i g^i U^{(i)}((1/2)X_n + (1/2)X_{n+1}).$$

Conditions sufficient to insure that the solutions of these systems be periodic to the orders of arbitrarily high powers of the step interval g are obtained. It is proved that the solutions of the difference equations can be represented by power series in g. It is shown that certain conditions on the functions $U^{(i)}(X)$ imply that the solutions of the difference equations are nearly periodic, and some numerical illustrations are presented. (L.T.W.)

3154

Radiation Lab., Univ. of Calif., Berkeley

ON THE NUMBER OF FEYNMAN DIAGRAMS. Robert J. Riddell, Jr. Mar. 5, 1953. 21p. (UCRL-2134)

The Feynman-Dyson formulation of a perturbation expansion for quantum field theory allows one to give a general combinatorial treatment to the Feynman diagrams involved. A very simple analysis for the total number of such diagrams, $T(n, \epsilon, \rho)$, in quantum electrodynamics, leads to

$$T(n, \epsilon, \rho) = \frac{(n!)^2}{(\epsilon!)^2\,(n-\epsilon)!} \cdot \frac{n!}{\rho!\,[(1/2)(n-\rho)]!\,2^{(1/2)(n-\rho)}}$$

in which n is the order of the perturbation and ϵ, ρ are the number of external electron and photon lines, respectively. The first factor is the number of different diagrams using only the electron lines and the second is that for the photon lines. In this total set of diagrams are many undesired ones; these are removed by means of generating functions. Relations which these functions satisfy are obtained, and from them one may readily find the exact numbers of diagrams desired, for not-too-large n. The generating functions are also used to find the asymptotic dependence on n, and it is found that this dependence is essentially unaffected by removing any specific type of graph. The sign alternations of the matrix elements in quantum electrodynamics are also considered in terms of similar generating functions. The generalization of the analysis to other types of interactions is also discussed. (auth)

MEASURING INSTRUMENTS AND TECHNIQUES

3155

[Northwestern Univ.]

A NEW APPROACH TO THE PROBLEM OF MEASURING NEUTRON ENERGY SPECTRA WITH Li^6 LOADED EMULSIONS. J. H. Roberts, J. Haugsnes, and D. E. Wood. [1952]. 6p. (AECU-2490)

In the Li^6 technique for measurement of neutron spectra, the uncertainty in locating the disintegration point along the alpha-triton track can be eliminated by using ground glass containing Li_2O. The glass specks (0.5 to 4 μ), loaded into nuclear-track emulsions, provided recognizable track origins. The glass may be loaded in a single plane for easy scanning. This technique should be useful for neutron spectra from 0.4 to 2.0 Mev and should give resolutions of the order of ±100 kev for isotropic incidence. (J.S.R.)

3156

Atomic Energy Research Establishment, Harwell, Berks (England)

THE QUENCHING ACTION OF PLUTONIUM AND IRON ON THE FLUORESCENCE OF URANIUM IN SODIUM FLUORIDE PHOSPHORS. G. N. Walton, G. Hutton, and J. A. W. Dalziel. July 30, 1952. 42p. (AERE-C/R-966)

The effect of Pu and Fe on the fluorescence of U in NaF melts illuminated by UV light has been measured over a wide range of concentrations. The transmission of NaF to UV light at different wavelengths shows that NaF alone, and also when containing Fe, has no absorption bands. NaF containing U has a wide absorption band in the UV. Fe, however, has a strong quenching action and it is proved that Fe does not quench by light absorption. It is also shown that the spectrum of the enhanced fluorescence of U does not change in the presence of small amounts of Fe and it is concluded that the initially excited states of U, and not the metastable fluorescent state, are subject to quenching by Fe. Merritt's theory for U fluorescence is amplified with reference to Förster's theory of resonance transfer, and the experimental quenching curves are interpreted on the basis of energy transfer and light absorption. The distance of energy transfer is calculated to be of the order 100 A. Förster's theory is criticized in that it fails to predict self-quenching. The absence of detectable fluorescence in Pu compounds is discussed. (auth)

3157

Atomic Energy Research Establishment, Harwell, Berks (England)

CHARACTERISTICS OF BF_3 COUNTERS AND PRECAUTIONS TO BE ADOPTED IN THEIR USE. J. Sharpe and P. G. Salmon. Dec. 3, 1952. 12p. (AERE-EL/R-1073)

This report describes the general characteristics of BF_3 counters and gives recommendations for their application in various types of apparatus, including methods of mounting to eliminate electrical breakdown at the insulators. (auth)

3158

Radiation Physics Lab., National Bureau of Standards

STUDIES OF PROTOTYPE MODELS OF BECKMAN, CAMBRIDGE, KELEKET, AND VICTOREEN 20-R AND 100-R ORGANIZATIONAL DOSIMETERS. Richard A. Elmendorf. Mar. 17, 1953. 25p. (NBS-2368)

Tests are described whereby the response of the instruments was examined over a wide range of dose rates and spectral energies. The tests were also designed to determine the general suitability of the instruments and their ability to function under rigorous conditions that may exist in emergency operations. The following data are given: (a) Co^{60} calibration tests, (b) average sensitivity of each to various energies of radiation, (c) directional dependence of each, using 200-kev x radiation, (d) scale-linearity tests, (e) drop tests, (f) overdose leakage tests , (g) dose-rate-dependence tests, (h) temperature-dependence tests, and (i) charging tests. (L.M.T.)

3159

Oak Ridge National Lab.

A PROTON RECOIL TYPE FAST-NEUTRON SPECTROMETER. R. G. Cochran and K. M. Henry. Issued Apr. 20, 1953. 36p. (ORNL-1479)

A triple-coincidence proton-recoil spectrometer has been developed for measuring neutron spectra of interest in shielding design. The instrument is composed of a triple-section proportional counter with suitable radiator-absorber wheels, amplifiers, electronic pulse-height selectors, and

a triple-coincidence circuit. The energy resolution is comparable to photographic plates which are at present the best method for neutron-spectra measurements. Considerable effort has been made to obtain maximum sensitivity by optimizing the available parameters. The spectrometer calibration was checked by measuring monoenergetic neutrons from the ORNL Van de Graaff generator. Excellent agreement with calculations was obtained for both energy and intensity. Several spectral measurements of Po-Be and Po-B sources have been included in this report as examples of the type of measurements that can be obtained with this instrument. (auth)

3160

Radiation Lab., Univ. of Calif., Berkeley

SCINTILLATION HAND AND FOOT COUNTER. William Goldsworthy. Jan. 27, 1953. 13p. (UCRL-2088)

The design of a scintillation counter for measuring the radioactive contamination of hands and feet is described. This simple, compact, and reliable unit has many advantages over gas-filled proportional counters and Geiger counters for this application. (auth)

3161

CRITICAL SURVEY OF TECHNIQUES OF BETA- AND GAMMA-SPECTROSCOPY. M. Deutsch. Physica 18, 1037-42(1952) Dec. (In English)

Some remarks on recent developments are presented, no references being given (G.Y.)

3162

PRECISION MEASUREMENT OF Co^{60} GAMMA-RADIATION. G. Lindström, A. Hedgran, and D. E. Alburger. Phys. Rev. 89, 1303-4(1953) Mar. 1

A precision determination of Co^{60} γ-ray energies was obtained in the following way. The K-electron line of the highly converted 1.41-Mev transition occurring in RaC decay was first measured absolutely in a semicircular-focusing uniform-field spectrometer. The RaC line was then compared in a double-focusing spectrometer with the K electrons due to the 1.33-Mev Co^{60} transition. From a weighted average of three comparisons the higher Co^{60} γ is found to have a value of 1.3325 ± 0.0003 Mev. After carefully checking the linearity of the double-focusing spectrometer, the momentum ratio of the two Co^{60} K conversion lines were then compared. Four comparisons give a value to the lower Co^{60} γ of 1.1728 ± 0.0005 Mev. (L.M.T.)

3163

WORK WITH THE 31-MEV BETATRON. I. MATERIAL TESTING EXPERIMENTS WITH THE 31-MEV BETATRON. W. Epprecht. Strahlentherapie 89, 161-74(1952). (In German) (cf. NSA 7-2973)

Experiments on the penetrating power of 31-Mev x rays, with test objects permitting measurement of the resolution and contrast caused by cavities, different thicknesses, various metals, and objects having great density differences, are described. (G.Y.)

3164

ELECTRONIC TRANSITIONS IN THE LUMINESCENCE OF ZINC SULFIDE PHOSPHORS. Richard H. Bube. Phys. Rev. 90, 70-80(1953) April 1.

The electronic transitions involved in the processes of absorption, excitation, emission, trapping, and photoconductivity, at room temperature, have been measured for ZnS phosphors, without added impurity, and with Ag, Cu, and Mn impurity. Three types of excitation transitions are found: (1) from the filled band to the conduction band, (2) from an impurity level above the filled band to the conduction band, and (3) from a ground-state level to an excited-state level of an impurity ion. The first two transitions result in trapping and photoconductivity; the third does not. Emission transitions occur from a level below the bottom of the conduction band to a level above the filled band. The same five major trap depths are common to all ZnS phosphors regardless of the nature of the impurity. Optical-trap emptying by visible light, like thermal trap emptying, involves a process of stimulation in which trapped electrons are raised into the conduction band before returning to luminescence centers to produce emission. A tentative energy-level diagram is constructed from the data obtained. 31 references. (auth)

3165

COMMON TYPES OF COUNTER TUBES. I. COUNTER TUBES FOR MEASUREMENT OF β RADIATION. H. Neuert. Arch. tech. Messen, No. 206, 59-62(1953) Mar. (In German)

Design and operating characteristics of various counter tubes for both quenching and proportional regions are summarized. 10 figures. (G.Y.)

3166

GRAIN DENSITY IN NUCLEAR EMULSIONS. Laurie M. Brown. Phys. Rev. 90, 95-7(1953) April 1.

A simple model of a nuclear-track emulsion is discussed in which it is assumed that a grain is made developable only if a charged particle loses in the grain an energy greater than some threshold value η. It is estimated that a particle of minimum ionization loses, on the average, an energy of order of magnitude η in traversing the diameter of a grain and, therefore, that fluctuations in the energy loss are important. This has as a consequence that the shape of the curve of grain density vs. energy and, in particular, the percentage relativistic increase of grain density may be sensitive to small variations of η. 19 references. (auth)

3167

COMPARISON OF GAMMA-RAY REFLECTIONS FROM THE (550) AND (310) PLANES OF QUARTZ. Harry C. Hoyt, Joseph J. Murray, and Jesse W. M. DuMond. Phys. Rev. 90, 169-70(1953) Apr. 1.

The limitations that arise from using the (310) reflecting planes of quartz in the energy region above 500 kev in measurements with the curved-crystal focusing γ-ray spectrometer are outlined. A comparison of the reflections from a very strong source of Au^{198} (412-kev γ rays) for the (310) and (550) planes showed the reflections from the (550) crystal to be 1/15.6 as intense as the (310) reflections. The use of the (550) planes of quartz along with the (310) planes will extend the range of the curved-crystal spectrometer to ~4 Mev and will materially increase the precision possible in the 1- to 2.0-Mev region. Since both sets of planes are parallel to the optical axis of the quartz, and since each set of (310) planes has a set of (550) planes turned only 16°6' away from it, it should be possible to make use of both sets of planes in a single crystal lamina. (L.M.T.)

3168

THE USE OF NEUTRON COUNTERS TO OBTAIN CLOUD-CHAMBER PHOTOGRAPHS OF V-PARTICLE DECAYS. K. H. Barker, R. D. Sard, and M. G. Sowerby. Phil. Mag. (7) 44, 46-50(1953) Jan.

In an attempt to increase the rate at which cloud-chamber photographs of V-particle decays can be obtained, a number of triggering arrangements incorporating BF_3 neutron counters have been used on the Pic du Midi (2867 m). The yields of V-particle decays are found to be comparable with the yield of a typical multiple Geiger counter system. (auth)

3169

MEASUREMENT OF NEUTRON DENSITIES BY RADIO-AUTOGRAPHY OF DETECTORS. A. Ertaud and P. Zaleski. J. phys. radium 14, 191-7(1953) Mar. (In French; cf. NSA 6-4155)

A method is presented for measuring neutron density by taking β-ray radioautographs of thin detectors irradiated in the neutron flux to be measured. Preparation and calibration of the detectors and choice and calibration of the emulsions are described. The method is very sensitive and precise, particularly adapted for very rapid variations in the neutron flux in a small space. It should be particularly suitable for the experimental study of neutron behavior in the vicinity of strong absorbers or in a region wherein are placed many materials of very different properties and small dimensions; for example, the interior of a pile. (tr-auth)

3170

A METHOD FOR PRESENTING LIQUID SAMPLES TO THE FLAT SURFACE OF A SCINTILLATION CRYSTAL. Hubert Sear. Nucleonics 11, No. 4, 52-3(1953) Apr.

In the course of plasma volume studies it was necessary to measure the radioactivity of many samples containing I^{131} by presenting them to the flat surface of a Tl-activated NaI crystal. For the presentation, a flat coil was wound of polyethylene tubing (0.023 in. I.D. and 0.038 in. O.D.) and held together by adhesive tape. A 21-gage needle containing the samples fits snugly in the tube. The volume can be easily determined and can be easily adjusted by removing turns from the periphery of the coil. (L.M.T.)

3171

DESIGN OF EXTENDED-SOURCE SCINTILLATION DETECTORS. J. D. Graves and R. H. Davis. Nucleonics 11, No. 4, 49-51(1953) Apr.

This is an extension of a previous article (Phys. Rev. 75, 1461(1949)). Experiments are described which were performed to establish design criteria for extended-source scintillation detectors. A light-collecting cylinder interposed between the phosphor and a 1P21 photomultiplier, reduces survey time with the scintillation detector by $\sim$1/2. It is emphasized, that for best results, effort should be made to maximize the detector's counting rate and sensitive area by choosing the correct cylinder length and diameter. (L.M.T.)

3172

A SIMPLIFIED AUTOMATIC ISODOSE RECORDER. A. Cole, E. B. Moore, and R. J. Shalek. Nucleonics 11, No. 4, 46-8(1953) Apr.

An automatic γ isodose recorder similar to the one described by Hine et al. (Rev. Sci. Instr. 21, 362(1950)) has proved reliable for γ-ray-therapy studies after 1 yr of operation. A complete description is given of this instrument, which can be applied to full-scattering mediums and has a maximum sensitivity of 3 r/hr with an error of 5%. (L.M.T.)

MESONS

3173

Rochester Univ.

THE TOTAL CROSS SECTIONS OF 37 MEV PIONS IN HYDROGEN. C. E. Angell and J. P. Perry. Mar. 24, 1953. 3p. (NYO-3710)

The total cross sections for the processes $\pi^+ + p$ and $\pi^- + p$ have been measured at a laboratory interaction energy for the pion of 37 $\pm$ 8 Mev, using a method previously described (Barnes, Phys. Rev. 87, 669(1952)). The "slow pions" and proton contamination described in this reference have been eliminated from the pion beam by the use of a second focusing magnet, and the pulse-height resolution of the scintillation-counter telescope has been improved. These facts enable the analysis of the data to be more independent of the characteristics of the pulse-height circuitry than was previously possible. The second focusing magnet, in conjunction with higher cyclotron operating levels, has increased the incident pion beam intensity to 13,000 π^+/min, and 5000 π^-/min through a 1 in. $\times$ 1 in. $\times$ 5 1/2 in. telescope. A summary of the results is shown. All numbers have been corrected for the muon and electron contamination of the beam. The errors indicated are the standard deviations due to counting statistics or due to fluctuations from the mean, whichever is larger. Since the π^- cross section includes charge-exchange scattering, the value of 5 $\pm$ 1.5 mb obtained by Roberts and Tinlot (Phys. Rev., to be published) at approximately this same energy has been used in calculating the total cross sections. The π^+ and π^- data are each based on 5.6×10^6 incoming pions.

	Measured Cross Section (millibarns)	Calculated Total Cross Sections (millibarns)		
		Isotropic	$\sin^2\theta$	$\cos^2\theta$
π^+	16.0 $\pm$ 1.0	20.8 $\pm$ 1	18.8 $\pm$ 1	26.4 $\pm$ 2
π^-	17.3 $\pm$ 1.4	21.0 $\pm$ 2	19.4 $\pm$ 2	25.3 $\pm$ 3

The measured cross section is that obtained from the attenuation of the pion beam by the CH_2 and C scatterers. It is then corrected for the solid angle subtended by the anticoincidence counter in order to obtain the total cross section. This is done for three assumed angular distributions in the c.m. system. (Entire report).

3174

Radiation Lab., Univ. of Calif., Berkeley

π^- AND μ^- MESON-INDUCED FISSION. Walter John and William F. Fry. Mar. 4, 1953. 9p. (UCRL-2113)

Meson-induced fission has been studied in U-loaded Ilford C-2 emulsions exposed to the π^- and μ^- meson beams of the Univ. of Chicago cyclotron. The 3762 π^- endings studied included 17 fission events and the 3573 μ^- endings studied included 8 fission events. The probability of a π^- meson ending in fission is found to be $4.5 \pm 1.5 \times 10^{-3}$ in C-2 emulsion containing 0.052 g/cm^3 of U. The corresponding probability for μ^- mesons is found to be $2.0 \pm 0.8 \times 10^{-3}$. Assuming the atomic capture probability is proportional to Z, it is found that (40 $\pm$ 20)% of π^- captures in U produce fission and about 20% of μ^- captures produce fission. (auth)

3175

PHOTOPRODUCTION OF NEUTRAL MESONS IN HYDROGEN AT HIGH ENERGIES. R. L. Walker, D. C. Oakley, and A. V. Tollestrup. Phys. Rev. 89, 1301-2(1953) Mar. 15.

Preliminary measurements have been made with the newly operating California Institute of Tech. synchrotron on the cross section for photoproduction of neutral pions in H at photon energies up to 450 Mev. The differential cross section at 90° (lab.) was measured in the manner of Silverman and Stearns, (Phys. Rev. 83, 853(1951); 88, 1225(1952)) by observing the recoil proton in coincidence with one decay photon from the π^0. The energy and angle of the recoil proton define, through the conservation laws, both the energy of the incident photon and the meson angle. The meson angle in the present measurements was 90° (lab.), which corresponds to 107° to 111° in the c.m. system, depending on the photon energy. (auth)

3176

THE KNOCK-ON ELECTRONS PRODUCED BY MESONS IN LEAD. E. Van A. Gey Van Pittius and I. J. Van Heerden. Physica 19, 1-8(1953) Jan.–Feb.

An experiment to determine the relation between the relative number of knock-on electrons excited in Pb layers by the penetrating component of cosmic radiation and the thickness of the Pb layer, is described. To ensure that only those penetrating particles above a certain limit in the energy spectrum is explored, the total Pb thickness for a whole series of readings was kept constant. An explanation of the curves that were obtained is also given. (auth)

3177
THE MASS RELATION OF HEAVY PARTICLES. H. Enatsu. Phys. Rev. 89, 1304-5(1953) Mar. 15.

In a previous note (Phys. Rev. 85, 483,(1952)) on the mass spectrum of heavy particles the calculation of self-energies was carried out only for the case of nucleons. This note extends the treatment to the case of heavy nucleons, the data showing the masses of cohesive mesons for the corresponding masses of heavy nucleons. (L.M.T.)

3178
DIRECT EXPERIMENTAL EVIDENCE FOR THE EXISTENCE OF A HEAVY POSITIVE V PARTICLE. C. M. York, R. B. Leighton, and E. K. Bjornerud. Phys. Rev. 90, 167-8(1953) Apr. 1.

Data obtained with a double cloud-chamber apparatus seem to substantiate the existence of a heavy charged V particle, the decay scheme of which may be suggested as: $V_1^+ \rightarrow p + \pi^0 + (Q \approx 40$ Mev). (L.M.T.)

3179
THE ELASTIC SCATTERING OF π-MESONS BY DEUTERONS. Thomas A. Green. Phys. Rev. 90, 161-2(1953) Apr. 1.

By using Fermi's phase-shift analysis of the cross sections for the scattering of π mesons by nucleons, the impulse approximation expression given by Fernbach et al. (Phys. Rev. 84, 1084(1951)) was evaluated for the elastic scattering of 135-Mev π mesons by deuterons. A comparison with experimental results of other investigators reveals that the calculated cross section is much too large in the region where experimental data are available. The reasons for this discrepancy are discussed. (L.M.T.)

3180
PHOTOPRODUCTION OF π^0 MESONS ON DEUTERONS. A. M. Baldin and V. V. Mikhaĭlov. Zhur. Eksptl'. i Teoret. Fiz. 23, 140-6(1952) Aug. (In Russian)

Details and extension of studies reported previously (NSA 6-4899) are presented. (G.Y.)

3181
THE PRODUCTION OF τ-MESONS IN ICE. A. J. Herz, P. E. Hodgson, and R. M. Tennent. Phil. Mag. (7) 44, 85-91(1953) Jan.

Nuclear-research emulsion has been exposed to the cosmic radiation under various thicknesses of ice. Three events interpreted as the decay of τ mesons have been observed, and measurements on their tracks show that these particles decay into three π mesons of total kinetic energy 73 ± 6 Mev and have mass 965 ± 12 m_e. They are found with a frequency of about 0·0008 τ mesons per star in emulsion exposed under ice. The emulsion was examined for nuclear disintegrations produced by heavy mesons, and for τ mesons decaying in flight, but no such events were found. The life time is shown to be longer than 10^{-9} sec. (auth)

3182
ELECTRONS ASSOCIATED WITH NEGATIVE μ MESONS. W. F. Fry. Nuovo cimento (9) 10, 490-4(1953) Apr. 1. (In English)

A study has been made in photographic emulsions of low-energy electrons associated with stopped negative μ-mesons from the University of Chicago cyclotron. A total of 1000 meson endings has been studied. Of these mesons, 358 decayed into a high-energy electron and 32 caused a star. The remaining 610 mesons stopped in the emulsion with no associated tracks other than tracks of low-energy electrons ($10 < E_e < 100$ kev). A low-energy electron track is observed from 17 of the 358 μ^--e decays (5%). The energy distribution of the low-energy electrons from the μ-e decays is consistent with the assumption that the low-energy electrons are monoenergetic. The average energy of these electrons is about 17 kev. The low-energy electrons are thought to be due to "Auger" transitions of the negative μ meson from the atomic capture in the light elements of the emulsion. One or more low-energy electron tracks are observed from 255 of the 610 stopped μ mesons which did not decay or cause a star. These electrons are thought to be due to mesonic "Auger" transitions from the heavy elements in the emulsion. The large difference in the probabilities of electron ejection from the mesonic capture in the light and heavy elements (5% as compared to 44%) is confirmed by a study of low-energy electrons associated with negative μ-meson stars. (auth)

METEOROLOGY

3183
Washington Univ., Seattle
ATMOSPHERIC TURBULENCE STUDY; ANNUAL PROGRESS REPORT [FOR] MAY 1, 1951–JULY 31, 1952. Robert G. Fleagle and Franklin I. Badgley. July 1952. 63p. (AECU-2492; Occasional Report 2)

An experimental technique is described for the observation of small-scale air motions near the ground which employs photography of the trajectories of particulate matter as it is carried in the air stream. The stereoscopic method was tested by photographing the trajectories of thistle-down in the lowest few meters of the atmosphere. Various phases of the instrumental and observational problems are discussed separately. Calculations of certain parameters of turbulence are presented to demonstrate the value of the stereo-photo in studying small-scale air motions near the ground. Computations of the coefficient of eddy conductivity at a given point in space and instant in time based on the continuity relation for thermal energy are presented. The agreement between observations of the nocturnal cold layer made by two different methods established that the coldest air frequently is present at night several cm above the ground surface. Possible mechanisms responsible for the cold layer are discussed. The assumption of constant shearing stress in dealing with statistical properties of turbulence in the lowest 25 m of the atmosphere is re-examined. Problems associated with the integration of heat conduction equations are discussed and the potential value of an accurate electrical analogue is emphasized. (C.H.)

MICROWAVES

3184
INTERACTION OF MICROWAVES PROPAGATED THROUGH A GASEOUS DISCHARGE PLASMA. L. Goldstein, J. M. Anderson, and G. L. Clark. Phys. Rev. 90, 151-2(1953) Apr. 1.

Experimental observations are reported on the interaction of two microwave signals which are simultaneously propagated through gaseous discharge plasmas. The frequencies chosen were 8600 and 9400 Mc (the 8600-Mc wave being pulse modulated) and the plasma, the length of which could be varied from 5.5 to 8.5 in., was produced either by continuous d-c or by pulsed d-c excitation. The waves were propagated in a wave guide containing a gaseous discharge tube. The observations reported concern the interaction of the electromagnetic waves in the decaying plasma following a 1- or 2-μsec excitation pulse, the measurements being made of the transmitted signals at various times after the cessation of the excitation of the plasma. The wanted continuous wave, transmitted through the decaying plasma and modulated by it, was detected through a highly selective resonant cavity. The amplified envelope was displayed on an oscilloscope, and with the application of the disturbing pulsed signal the envelope was modified. The duration of

this effect after the removal of the disturbing wave varied as a function of the nature of the gas and its pressure. The interactions are shown in He at 12-mm Hg pressure and in A at 2.7 mm Hg pressure. (L.M.T.)

MOLECULAR PROPERTIES

3185

Atomic Energy Project, Univ. of Calif., Los Angeles

THE SIZE OF DESOXYRIBONUCLEIC ACID MOLECULES. Amos Norman and John Rowen. Mar. 19, 1953. 7p. (UCLA-249)

Many investigators agree that desoxyribonucleic acid (DNA) molecules are thread-like structures ~1 μ in length. This raises the question of how molecules of such great length are incorporated into DNA-containing biological units that are less than 1 μ in diameter. The problem is illustrated by preliminary measurements on the DNA extracted from E. coli. The molecules were found to be between 0.8 to 1.0 μ long whereas the nuclei of this organism are less than 0.6 μ in diameter. (auth)

3186

MEASUREMENT OF THE NUCLEAR AND ELECTRONIC CONTRIBUTIONS TO THE SPECIFIC HEAT OF NEODYMIUM ETHYL SULFATE NEAR 1°K. L. D. Roberts, C. C. Sartain, and B. Borie. Revs. Mod. Phys. 25, 170-3 (1953) Jan.

The molar specific heat C_I of Nd ethyl sulfate has been measured on three samples of separated Nd isotopes in the temperature range 0.95 to 2.15°K by the magnetic method of Benzie and Cooke at frequencies from 300 to 1200 cps. The measured C_I may be described within 1% by $C_I = b/T^2$, where T is the temperature and b is the constant. All three samples were shown by x-ray diffraction measurements to have the same structure as that given for Nd ethyl sulfate by Ketelaar. For the electron contribution to the specific heat we obtained $b_e = 0.146 \pm 0.004 \times 10^5$, and for the hyperfine splitting contributions we obtained $b_{143} = 5.08 \pm 0.05 \times 10^5$ and $b_{145} = 1.7 \pm 0.2 \times 10^5$ erg degree. These values of b_{143} and b_{145} agree within experimental error with the corresponding values computed from the microwave measurements of Scovil. Thus, the hyperfine splitting contribution to the specific heat for $Nd^{143}(C_2H_5SO_4)_3 \cdot 9H_2O$ is some 35 times larger than the electron contribution which makes this material of interest for the study of nuclear effects below 1°K. (auth)

NEUTRONS

3187

Brookhaven National Lab.

PROCEEDINGS OF THE MEV NEUTRON CROSS SECTIONS CONFERENCE [HELD AT] BROOKHAVEN [ON] JANUARY 20 AND 21, 1953. 23p. (BNL-224)

The discussions concerning neutron cross-section work may be summarized as follows: Total Cross Sections. New theoretical aspects; work in the 1- to 10-kev region with the Argonne and Duke Van de Graaffs and the Brookhaven fast chopper; Oak Ridge and Bartol work around 1 Mev; work up to 20 Mev at Los Alamos; fission cross-section measurements at Oak Ridge; and (n,p), (n,α), and (n,2n) induced-activation cross-section measurements at Chalk River. Inelastic Scattering. Total collision cross-section measurements at Los Alamos; inelastic-scattering work at MIT; elastic-scattering angular-distribution measurements at Los Alamos; present theory of inelastic and (n,2n) reactions; report on background problems made at Bartol; and Los Alamos measurements on the γ radiation from inelastic scattering. Neutron Detectors and Instrumentation. Problems associated with obtaining pulsed neutron sources for the Westinghouse, Duke, and Oak Ridge Van de Graaffs and the Cornell and Los Alamos cyclotrons; application of alternating-gradient strong focusing for the Minnesota accelerator; neutron detection schemes using a He^3 proportional counter at Brookhaven and Li-containing scintillators at Oak Ridge; and application of the Ranger method at Vanderbilt as a useful neutron spectrometer. (L.M.T.)

NUCLEAR PHYSICS

3188

Carnegie Inst. of Tech.

GRAPHICAL METHOD FOR OBTAINING PHASE SHIFTS FROM THE EXPERIMENTAL DATA ON MESON-NUCLEON SCATTERING; RESEARCH AND DEVELOPMENT OF PHENOMENA RELATING TO THE INTERACTIONS OF PARTICLES AND OF RADIATION; TECHNICAL REPORT [FOR] JANUARY 1, 1952 TO DECEMBER 31, 1952. Julius Ashkin and Seymour H. Vosko. Feb. 2, 1953. 12p. (NP-4497; Technical Report 2)

Fermi has shown that the present data on meson-nucleon scattering is consistent with the assumptions that the meson-nucleon interaction is charged-independent and that, for the energy range <135 Mev, only the waves of orbital angular momentum L = 0 and L = 1 are appreciably scattered. The meson-nucleon states may be classified by their eigenvalues for total isotopic spin, total angular momentum, and orbital angular momentum. There are accordingly six states involved in the scattering, each with its appropriate scattering phase shift. Fermi, with the help of the high-speed computer at Los Alamos, has recently given a very rapid and accurate numerical method for finding these six phase shifts. This report presents a less accurate, but convenient, graphical method for finding the phase shifts, which cannot really compete with the numerical method, but which may give some insight into the structure of the phase-fitting problem and be useful for rough estimations. (L.M.T.)

3189

Carnegie Inst. of Tech.

TENSOR OPERATORS IN ISOTOPIC SPIN SPACE; RESEARCH AND DEVELOPMENT OF PHENOMENA RELATING TO THE INTERACTIONS OF PARTICLES AND OF RADIATION; TECHNICAL REPORT [FOR] JANUARY 1, 1952 TO DECEMBER 31, 1952. L. Wolfenstein. Feb. 2, 1953. 14p. (NP-4498; Technical Report 3)

Watson and others have discussed the consequences of charge independence on pion production in nuclear collisions. To treat this problem we consider operators which transform like the components T_{JM} of an irreducible tensor under rotations in isotopic spin space. Charge independence requires that the average value of such an operator in the final state must be a linear combination of the average values of an operator with the same J and M in the initial state. The operator $(a_1^* a_1 + a_2^* a_2 - 2a_3^* a_3$ where a^* and a are pion creations and annihilation operators, respectively) transforms like T_{20}. In a collision of a nucleon with a target of isotopic spin zero, therefore, the final average value of this operator is zero. The number of charged mesons equals twice the number of neutral mesons, as has been previously deduced. Similarly it may be shown that, in the collision of two protons, at least half the pions produced must be charged. (auth)

3190

Carnegie Inst. of Tech.

COULOMB INTERFERENCE EFFECTS IN THE SCATTERING OF MESONS BY PROTONS; RESEARCH AND DEVELOPMENT OF PHENOMENA RELATING TO THE INTERACTIONS OF PARTICLES AND OF RADIATION; TECHNICAL REPORT [FOR] JANUARY 1, 1952 TO DECEMBER 31, 1952. Julius Ashkin and Lloyd Smith. Feb. 2, 1953. 17p. (NP-4500; Technical Report 1)

Coulomb interference effects in the scattering of π^+

mesons by protons have been evaluated at 135 Mev (laboratory kinetic energy of the meson) using Fermi's scattering phase shifts. The scattering of positive pions at 78 Mev has also been investigated. At 135 Mev, experimental verification would require very difficult observations at scattering angles of less than 15°. The coulomb effect for positive-pion scattering at 78 Mev is larger and is important at larger angles. At this energy an experimental decision between the two possible choices of signs of the scattering phase shifts appears possible. (auth)

3191

Oak Ridge National Lab.

ON THE STATISTICAL THEORY ON NUCLEAR REACTIONS. Bernard L. Cohen. Issued Apr. 20, 1953. 19p. (ORNL-1504)

If Weisskopf's expression for the energy distribution, N(E), of particles emitted from nuclear reactions which proceed via a compound nucleus is generalized by dropping his assumption that the sticking probability η for the inverse reaction is independent of energy, one obtains

$$\frac{1}{\Sigma(E,E_0)} = -\frac{\partial \log \eta}{\partial E} + \frac{1}{T(E_0-E)}$$

where

$$\Sigma = \left[-\frac{\partial \log \frac{N(E)}{E}}{\partial E} \right]^{-1}$$

the slope of the energy spectrum as usually plotted. The following evidence is cited to show that the $-(\partial \log \eta/\partial E)$ term (hereafter (A)) is not negligible: (a) all observed neutron and proton (energy high enough so that coulomb barrier is negligible) energy spectra curve away from the axis whereas assuming (A) $\neq 0$ demands curvature toward the axis; (b) comparing these observed spectra show that Σ is definitely not a function of (E_0-E) alone; (c) the values of (A) required to remove the large discrepancies between observed and calculated (n,p) and (n,α) cross sections are roughly consistent with those obtained from the experimental energy spectra. Assuming (A) not neglectible means that selection rules operate to make transitions to low-lying levels excessively probable. It also demands that if excited nuclei could be bombarded —an impossible experiment— sticking probabilities would not be unity as they are when ground-state nuclei are bombarded. (auth)

3192

A GRAPHICAL REPRESENTATION OF THE ENERGY VALLEY SURFACE BASED ON RECENT ISOTOPIC MASS DETERMINATIONS. Heinz Ewald. Z. Naturforsch. a8, 116-20(1953) Feb.–Mar. (In German)

Measurements and calculations made in recent years of isotopic masses are applied to graphical representation of the bottom of the nuclear-energy valley. The magic neutron numbers 2, 8, 20, 28, 50, 82, and 126 are indicated as dislocations and bends in the otherwise smooth course of the surface. The magic proton numbers seem to have only a small analogous influence. (tr-auth)

3193

CERTAIN REGULARITIES IN FORMATION OF NUCLEAR SPIN AND NUCLEON SHELL MODEL. I. A. Vaĭsman. Doklady Akad. Nauk. S.S.S.R. 88, 237-40(1953) Jan. 11. (In Russian)

A table showing the regularities in nuclear spins, magnetic moments, orbital moments, and configurations among the elements is presented. The significance of the data with respect to the nuclear shell model is discussed. (G.Y.)

3194

NONEXISTENCE OF STABLE ISOBARS WITH ODD MASS NUMBER. S. Sengupta. Phys. Rev. 89, 1296-7(1953) Mar. 15.

Fuchs (Proc. Cambridge Phil. Soc. 35, 242(1939)) in his analysis of the distribution of stable nuclei did not make it clear why in all cases of nuclei with odd mass number only one stable nucleus and no isobars are found. This note presents a formal proof of this phenomenon on the basis of like-particle forces and saturation of nuclear forces. (L.M.T.)

3195

A NEW PARAMETER FOR USE IN DISCUSSIONS OF THE SHELL MODEL OF THE NUCLEUS. N. Feather. Phil. Mag. (7) 44, 103-5(1953) Jan.

The shell model and the liquid-drop model of the nucleus derive from approximations to a theory of nuclear structure which are distinct and to a large extent mutually contradictory. Each model, however, has had considerable success in correlating the results of experiment in a wide field. This note draws attention to a method of using certain experimental results which focuses attention on the differences between the properties of real nuclei and those predicted by the von Weizsäcker formula (taken as representing the liquid-drop model). (auth)

3196

A DIFFRACTION EFFECT ILLUSTRATING THE TRANSPARENCY OF NUCLEI TO HIGH ENERGY NEUTRONS. J. D. Lawson. Phil. Mag. (7) 44, 102-3(1953) Jan.

In the "continuum" nuclear model, the nucleus is roughly represented by a sphere possessing a complex refractive index to neutron waves, the real part of the refractive index being due to the nuclear potential well, and the imaginary part representing a loss of neutrons by absorption or inelastic scattering. The value of the imaginary potential iV' is unimportant in nuclear calculations so long as its value is small compared to the depth of the potential well V and the incident neutron energy E. With this model it is easy to find the change of phase of the neutron wave if a slab of nuclear matter of depth D is placed with its faces parallel to the wavefront. If a sphere of diameter D with a refractive index $\approx$ unity replaces the slab, there will be behind it a circular region of diameter $\approx$ D where the average value of the phase retardation is less than that which would be caused by a slab thickness D. The diffraction scattering will be a maximum when this phase change is an odd multiple of π, and a minimum when an even multiple. A phase change of $n\pi$ will occur at an energy given by $E = 10^{26}\,\pi^2\,\epsilon^2\,D^2/n^2$, where ϵ is a constant < 1. Taking values of 0.6 for ϵ, and $2.8 \times 10^{-13}\,A^{1/3}$ for D, the value of E for which n = 1 for C, Al, Cu, Cd, and Pb roughly corresponds with the peaks in the neutron total cross section curves for these elements as determined by Taylor and Wood (Phil. Mag. (7) 44, 95(1953)). (L.M.T.)

3197

EXCITED STATES OF NUCLEI IN jj-COUPLING. B. H. Flowers. Physica 18, 1101-4(1952) Dec. (In English)

A brief account is given of the classification of states arising from a configuration j^n of neutrons and protons in jj coupling with short-range central interactions, and evidence is brought to suggest that the classification has experimental confirmation. On the basis of the new classification it is possible to lay down certain approximate selection rules for radiative transitions. Some of these rules are discussed. (auth)

NUCLEAR PROPERTIES

3198

Purdue Univ.

ISOMERISM OF In^{110} AND In^{112}. E. Bleuler, J. W. Blue, S. A. Chowdary, A. C. Johnson, and D. J. Tendam. [1952]. 15p. (AECU-2500)

The decay of In^{110} and In^{112} has been investigated with the aid of β-ray-spectrometer and coincidence measurements.

From the half life, 20.7 ± 0.3 min, and the K/(L + M) ratio, 3.7 ± 0.4, the 155 ± 1 kev isomeric transition in In^{112} is identified as M3. The 14.5 ± 1 min ground state emits an allowed negatron spectrum of 656 ± 6 kev and an allowed positron spectrum of 1.52 ± 0.05 Mev. Even parity and spins of 4 and 1 are assigned to the two states. The 66-min ground state of In^{110} decays by emission of an allowed positron spectrum of 2.25 ± 0.02 Mev to the 657-kev level of Cd^{110}. The electron capture from the 4.9 ± 0.2 hr isomeric state is followed by the known 884-, 937-, and 657-kev γ rays in Cd^{110}. Even parity is assigned to both levels. Conversion lines, with K/(L + M) = 4.5 ± 1, indicate an additional γ ray of 121 kev which may be the isomeric transition having a branching ratio of about 0.6%. It would have to be an M3 transition with an abnormally long (factor 10^3) half life. The existence of the In^{110} isomer is shown to remove several difficulties in the interpretation of the excitation curves of the α-particle reactions with Ag. (auth)

3199

ELECTRON DISTRIBUTION IN TRIPHENYLMETHYL; HYPERFINE STRUCTURE OF THE PARAMAGNETIC RESONANCE ABSORPTION OF $(C_6H_5)_3C^{13*}$. S. I. Weissman and John C. Sowden. J. Am. Chem. Soc. 75, 503(1953) Jan. 20.

The paramagnetic resonance absorption spectrum of triphenylmethyl enriched to 53% of C^{13} in the methyl position consists of three equally spaced lines. The interval between the low-field and high-field lines is 22 ± 5 gauss. The splitting arises from an average field at the C^{13} nucleus of ~3 × 10^4 gauss, corresponding to a separation of 0.7 A between the unpaired electron and the nucleus of the methyl carbon atom. (G.Y.)

3200

NEUTRON CAPTURE CROSS SECTIONS FOR PRODUCTION OF Sc^{46} AND Sr^{85}. W. S. Lyon. Phys. Rev. 89, 1307(1953) Mar. 15.

Samples of spectroscopically pure Sc_2O_3 together with weighed pieces of Al-Mn alloy of known Mn concentration were neutron-irradiated for eight hours. Upon removal from the reactor the decay of the monitor metal was followed in a calibrated ionization chamber, the Mn^{56} activity determined, and the neutron flux calculated. Samples of the Sc_2O_3 were then weighed on an analytical balance, the activity of the daughter Sc^{46} determined from ion-chamber measurements, and the pile-neutron cross section for Sc^{46} production calculated as 21.6 ± 2.0 b. The cross section for production of Sr^{85} was determined in essentially the same manner, the sample being enriched in Sr^{84}(46%) and Co used as the monitor metal. By using the Sunyar decay scheme the thermal neutron capture cross section for production of Sr^{85} was calculated as 1.2 ± 0.1 b. (L.M.T.)

3201

ANGULAR DISTRIBUTION AND POLARIZATION OF GAMMA RADIATION EMITTED BY ORIENTED NUCLEI. H. A. Tolhoek and J. A. M. Cox. Physica 19, 101-19(1953) Jan.–Feb.

The angular distribution and polarization of γ radiation emitted by oriented nuclei is calculated assuming pure multipole transitions. For the description of the orientation of the nuclei 2j independent parameters f_k are used; these are essentially the statistical tensors introduced by Fano (j is the spin quantum number of the nuclei). The state of polarization of the γ radiation is characterized by the degree of polarization P and a real three-dimensional polarization vector ξ_0. If these quantities f_k, P, and ξ_0 are used, the formulas take a relatively simple form. For the cases of dipole and quadrupole radiation expressions are given which are suitable for numerical calculation by easy substitutions. (auth)

3202

THE HYPERFINE STRUCTURE OF THE $3p\,^2P_{1/2}$ STATE OF Al^{27}. Hin Lew and Günter Wessel. Phys. Rev. 90, 1-3(1953) April 1.

The hyperfine structure interval of the $3p^2P_{1/2}$ state of Al^{27} has been measured and found to be 1506.14 ± 0.05 Mc. From this datum and the known hyperfine structure of the $3p^2P_{3/2}$ state a recalculation of the nuclear electric quadrupole moment, taking into consideration configuration interaction, yields the value Q = +0.149 × 10^{-24} cm^2. (auth)

3203

ELECTRIC QUADRUPOLE RESONANCE OF CHLORINE IN $HgCl_2$. Maurice Buyle-Bodin and André Monfils. Compt. rend. 236, 1157-60(1953) Mar. 16. (In French)

The degree of ionicity in the Hg–Cl bond in the $HgCl_2$ molecule was found to be ~55%. The effect of the temperature on the resonance frequencies was determined and interpreted. (tr-auth)

3204

GEOMETRICAL SOLUTION FOR A NUCLEAR MOMENT IN A MAGNETIC FIELD. Roald K. Wangsness. Am. J. Phys. 21, 274-6(1953) Apr.

The general solution of the classical equation of motion $d\underline{\mu}/dt = g(\underline{\mu} \times \underline{H})$, when $\underline{H}$ consists of a constant field plus a perpendicular rotating component can easily be obtained after transforming the problem to a properly chosen rotating coordinate system. The value of this method for teaching purposes is discussed. (auth)

3205

TOTAL CROSS SECTIONS FOR 400-MEV NEUTRONS. V. Alexander Nedzel. Phys. Rev. 90, 169(1953) Apr.

Total-cross-section measurements are being made with good-geometry transmission in the well-collimated neutron beam of the University of Chicago synchrocyclotron. Although the program is not complete, tentative measurements are reported for H, C, Cu, Cd, Pb, Th, and U. (L.M.T.)

3206

NEUTRON TOTAL CROSS SECTIONS BETWEEN 30 AND 153 MEV. A. E. Taylor and E. Wood. Phil. Mag. (7) 44, 95-101(1953) Jan.

The neutron total cross sections of C, Al, Cu, Cd, and Pb have been determined as a function of energy in the range 30 to 139 Mev. The Pb total cross section shows a dip at about 60 Mev and corresponding dips in the Cd and Cu cross sections appear to occur between 30 and 40 Mev. The neutron total cross section of H has been measured as 56.9 ± 1.8 × 10^{-27} cm^2 at a neutron energy of 126 ± 2 Mev. (auth)

3207

THE NUCLEAR SPINS AND MAGNETIC MOMENTS OF ^{24}Na, ^{42}K, ^{86}Rb, ^{131}Cs AND ^{134}Cs. E. H. Bellamy and K. F. Smith. Phil. Mag. (7) 44, 33-45(1953) Jan.

The atomic-beam magnetic-resonance method has been used to find the nuclear spins and the ground-state hyperfine structure splittings of the radioactive alkali atoms Na^{24}, K^{42}, Rb^{86}, Cs^{131}, and Cs^{134}. The spins and $\Delta\nu$ values were obtained by observing $\Delta F = 0$, $\Delta m = \pm 1$ transitions in weak and intermediate fields, and the Fermi-Segrè relation was used to calculate the magnetic moments from the results. More accurate $\Delta\nu$ values were also found for Na^{24} and K^{42} by locating $\Delta F = \pm 1$, $\Delta m = \pm 1$ transitions. The results are tabulated below.

Isotope	I	Hfs (Mc)	μ (n.m.)
Na^{24}	4	1139·35 ± 0·10	+1·688 ± 0·005
K^{42}	2	1258·9 ± 0·1	−1·137 ± 0·005
Rb^{86}	2	3960 ± 20	−1·69 ± 0·01
Cs^{131}	5/2	13200 ± 110	+3·48 ± 0·04
Cs^{134}	4	10440 ± 30	+2·95 ± 0·01. (auth)

3208
BINDING ENERGY OF He^5 AND Li^6. G. Morpurgo. Nuovo cimento (9) 10, 473-89(1953) Apr. 1. (In Italian)

By making use of wave functions describing a deuteron and an α particle, the authors have calculated the dependence of the binding energy of Li^6 on the distance between the center of mass of the α particle and the center of mass of the deuteron. The largest binding energy is obtained (if the nuclear parameters are subjected to the saturation conditions) when the deuteron and the α particle are an infinite distance apart; this is due to the fact that the absolute value of the potential energy increases much slower than the kinetic energy when the distance decreases; probably the saturation conditions are responsible for this slow increase. For purpose of comparison, analogous calculations have been done for He^5. In agreement with the magnetic moment, in Li^6 the S wave function gives rise, for each distance, to an higher binding energy than the P state; the opposite is true for He^5. (auth)

3209
INFLUENCE OF THE NUCLEAR QUADRUPOLE MOMENT ON THE α-γ ANGULAR CORRELATION IN RADIOTHORIUM. A. Abragam and R. V. Pound. Phys. Rev. 89, 1306-7(1953)

The purpose of this note is to show that quadrupole coupling provides an explanation for the discrepancy between experimental and theoretical values of the α-γ angular correlation in the disintegration of radiothorium which has recently been investigated by two different groups. (auth)

3210
RELATIVE ENERGY LEVELS OF SOME P SHELL NUCLEI IN INTERMEDIATE COUPLING. Edwin A. Crosbie. Phys. Rev. 90, 138-41(1953) April 1.

The relative energy levels of the low states for configurations consisting of 2, 3, 4, 8, 9, and 10 nucleons in the P shell are shown for all values of the spin-orbit to interaction-energy ratio by means of second-order perturbation calculations in both extreme coupling schemes. The interaction potential is assumed to be a linear combination of ordinary, and space, spin, and charge exchange terms. Coulomb forces are ignored so that the charge quantum number T is a constant of the motion. Comparison is made with the first few excited states of some light nuclei. There is some evidence that the spin orbit energy is relatively more important for N^{14} than for Li^6. (auth)

3211
THE FIRST EXCITED STATES OF EVEN-EVEN NUCLEI. Kenneth W. Ford. Phys. Rev. 90, 29-43(1953) April 1.

The collective model of the nucleus, as expressed in A. Bohr's strong-coupling approximation, is applied to the low levels of even-even nuclei. It yields the correct level order of the first few states, and predicts the qualitative regularities of the first excited-energy surface which are observed experimentally. The approximation is shown to be much better for two or more extra nucleons than for one, but the first excited-energy spacing is sensitive to second-order corrections even for many extra nucleons. Predicted nuclear distortions are larger than is reasonable in the rare-earth group, and near doubly magic Pb^{208}. An empirical way to correct for this discrepancy is to diminish the particle-to-surface coupling coefficient. A simple formula is given for computing an upper limit to the nuclear distortion from the first excited energy of even nuclei. After correction by a single adjustable parameter, this formula yields a fair correlation with quadrupole moments and a better correlation with isotope shifts in the region $50<N<126$. The energy-level behavior beyond Pb gives a prediction of quadrupole-moment and isotope-shift behavior for $N>126$. Certain regularities in the levels of odd-even nuclei are also predicted. (auth)

3212
PURE NUCLEAR QUADRUPOLE SPECTRUM OF Bi^{209} IN BISMUTH-TRIPHENYL. H. G. Robinson, H. G. Dehmelt, and Walter Gordy. Phys. Rev. 89, 1305(1953) Mar. 15.

This note is concerned with fitting the frequencies of the nuclear quadrupole spectrum of Bi^{209} in triphenyl-bismuth which have been observed by Dehmelt and Krüger (Z. Physik 129, 401(1951)) to the theoretical values for the case of deviation from axial symmetry. (L.M.T.)

NUCLEAR REACTORS

3213
[Oak Ridge National Lab.]
COOLING HOLE DISTRIBUTION FOR REACTOR REFLECTORS. William S. Farmer. Sept. 3, 1952. 9p. (CF-52-9-201)

In the reflector surrounding the core of a nuclear reactor heat generation occurs. In order to keep the thermal stresses within allowable limits or safe guard the reflector from damage, coolant holes must be so distributed as to limit the reflector temperature. Contained in this memo are a series of plots by which the hole distribution can be obtained for a given set of operating conditions for BeO, Be, graphite, and BeO-glass. (auth)

3214
North American Aviation, Inc.
A LOW POWER WATER BOILER REACTOR NEUTRON SOURCE. A. T. Biehl, T. Fahrner, S. W. Kash, R. Balent, E. Clark, D. F. Howard, H. Jarvis, M. E. Remley, and E. Weisner. Issued June 26, 1952. 12p. (NAA-SR-Memo-304)

A discussion of a low-power Water Boiler neutron source in operation at the Atomic Energy Research Department of North American Aviation, Inc. is presented. The core of the reactor consists of a small stainless-steel sphere containing a U^{235}-enriched uranyl nitrate solution. The sphere is surrounded by a cylindrical graphite reflector, which in turn is surrounded by a concrete-block shield. The reactor is designed to operate at power level of 100 milliwatts, giving a maximum flux of 4×10^8 thermal neutrons/cm^2-sec. (auth)

3215
PRODUCTION OF NUCLEAR FUELS BY INDUCED RADIOACTIVE CHAINS. Louis Gold. Nucleonics 11, No. 4, 40-4(1953) Apr.

The reaction kinetics associated with the large-scale production of artificial isotopes that result from a radioactive chain induced by neutron irradiation in a reactor are discussed. Specific application is made to Pu^{239} and U^{233}, and it is calculated that for 1-kg quantities, reactor power levels of ~200 and 32 Mw, respectively, are required for irradiation of feed materials. A factor affecting the overall time which must elapse prior to chemical separation of the final product is the ultimate recovery efficiency required; excessive aging times are sometimes necessary to allow radioactive decay of intermediate nuclei. It appears that rapid stock-piling of nuclear fuels will be by irradiation of natural U rather than Th, since the conversion $Np^{239} \rightarrow Pu^{239}$ is more rapid than $P^{233} \rightarrow U^{233}$. (L.M.T.)

3216
FAST FISSION FACTOR FOR HOLLOW NATURAL URANIUM CYLINDERS. Raymond L. Murray and A. C. Menius, Jr. Nucleonics 11, No. 4, 21-3(1953) Apr.

In determining accurately the multiplication factor of a heterogeneous natural-U reactor by the familiar formula $k_\infty = \epsilon p \eta f$, the fast fission factor ϵ must be considered. A calculation of ϵ is presented for the more general geometry of hollow U cylinders using the theory of Guggenheim and Pryce (MT-199(1945)) and the declassified fast fission

cross sections of U. It is thought that the tabular and graphical results presented may be of use in the design of heterogeneous reactors in which the coolant flows through a central duct in the U slugs rather than in an annular duct. (L.M.T.)

3217

DELAYED PHOTONEUTRONS IN A HEAVY-WATER REACTOR. Arne Lundby. Nucleonics 11, No. 4, 16-17 (1953) Apr.

Fission-product γ rays acting on the heavy-water moderator makes it a neutron source. The effect of these neutrons on reactor kinetics is described. For JEEP, photoneutrons correspond to about 0.04 watt a few days after shut-down. (auth)

NUCLEAR TRANSFORMATION

3218

Northwestern Univ.

THE ANGULAR DISTRIBUTION OF $Li^6(n,\alpha)H^3$ FOR NEUTRONS OF 200, 270, 400, AND 600 KEV. Lillian E. Darlington, Jack Haugsnes, Harry M. Mann, and James H. Roberts. [1952]. 19p. (AECU-2481)

The angular distribution of $Li^6(n,\alpha)H^3$ has been measured for neutron energies of 200, 270, 400, and 600 kev by determining the distribution of triton tracks from this reaction in Ilford C2 plates loaded with enriched Li^6. The results fit a series of the type $A + B\cos\phi + C\cos^2\phi$ where ϕ is the neutron-triton angle in the c.m. system. This indicates that the s and p components of the incident neutron wave predominate in the interaction. (auth)

3219

Purdue Univ.

THE (α,n) AND $(\alpha,2n)$ CROSS SECTIONS OF Ag^{109}. E. Bleuler, A. K. Stebbins, and D. J. Tendam. [1952]. 11p. (AECU-2499)

The excitation curves for the reactions $Ag^{109}(\alpha,n)In^{112}$ and $Ag^{109}(\alpha,2n)In^{111}$ have been measured for α energies up to 19.5 Mev. The threshold energy for the $(\alpha,2n)$ reaction is 14.8 ± 0.2 Mev. The sum of the cross sections agrees approximately with the total cross section calculated for a radius $R \sim 1.6 \times 10^{-13}$ cm. The energy dependence of the ratio $\sigma(\alpha,2n)/\sigma(\alpha,n)$ can be interpreted as being in agreement with either a nearly constant nuclear temperature of 1.7 Mev or with a level density $\omega(E) = \text{const.} \exp[2(aE)^{1/2}]$, with $a = 2.5\ \text{Mev}^{-1}$. The corresponding temperature $\theta = (E/a)^{1/2}$ varies from 1.7 to 2.2 Mev for excitation energies between 7.5 and 12 Mev. These apparent temperatures are considerably higher than those found by direct measurement of (p,n) and (n,n) neutron spectra. (auth)

3220

Radiation Lab., Univ. of Calif., Berkeley

THE $T^3(p,\gamma)He^4$ REACTION. Robert W. Birge and John Jungerman. Feb. 11, 1953. 12p. (UCRL-2109)

The excitation function for the reaction $T^3(p,\gamma)He^4$ has been extended to proton energies of 7.3 Mev. No experimental evidence is found for a resonance in the reaction up to this energy of bombarding protons. (auth)

3221

PHOTONUCLEAR REACTIONS WITH THE FORMATION OF PROTONS. Translated from Uspekhi Fiz. Nauk 44, 437-42 (1951). 7p. (AEC-TR-1523; ATI-132081)

All the pertinent data of this translation appeared in an article by Diven and Almy (Phys. Rev. 80, 407(1950); NSA 5-223). (L.M.T.)

3222

NON-OBSERVATION OF THE $Fe(n,\alpha)Cr$ REACTION UNDER THE ACTION OF THERMAL NEUTRONS. Henriette Faraggi. J. phys. radium 14, 160-8(1953) Mar. (In French)

The observation of the $Fe^{56}(n,\alpha)Cr^{53}$ reaction under the action of slow neutrons having given rise to contradictory results, the author has repeated the investigations under experimental conditions as favorable as possible. The reaction was not observed. The experiments described permit fixing an upper limit to the cross section for this reaction, if it exists, of 10^{-29} cm^2. Positive results obtained by other authors may be attributed to poor discrimination between α particles and protons in the nuclear emulsions. Comparison of the experimental limit obtained and the theoretical predictions, as well as data on the exact masses and binding energies, permit the conclusion that the reaction energy is certainly <3.5 Mev and probably zero. (tr-auth)

3223

THE FORMATION OF A COMPOUND NUCLEUS IN NEUTRON REACTIONS. Herman Feshbach, Charles E. Porter, and Victor F. Weisskopf. Phys. Rev. 90, 166-7(1953) Apr. 1.

The theory for total neutron cross sections by Feshbach and Weisskopf (Phys. Rev. 76, 1550(1949)) was developed under the assumption that the incident neutron and the target nucleus immediately form a compound nucleus. In this note, total neutron cross sections have been recalculated with the following model: the nucleus is replaced by a potential well with a complex potential, $V(r) = -V_0(1 + i\zeta)$ for $r < R$, and $V(r) = 0$ for $r > R$, where V_0 is a real number giving the depth of the well, R is the nuclear radius, and ζ is a parameter which indicates an "absorption" for neutrons within nuclear matter. Calculations are shown for $V_0 = 19$ Mev, $R = 1.45 \times 10^{-13} A^{1/3}$ cm, and $\zeta = 0.05$, a choice which reproduces all the main features of the experimental results, and a comparison is made with Feshbach and Weisskopf's results. From the results it appears that in the energy range considered (0 to 3.0 Mev) the neutron penetrates a distance of about 2×10^{-12} cm into nuclear matter before it is incorporated into a collective compound motion. (L.M.T.)

3224

LEVELS IN N^{14} FROM THE $C^{13}(p,\gamma)N^{14}$ REACTION. D. Hicks, T. Husain, L. G. Sanders, and L. E. Beghian. Phys. Rev. 90, 163-4(1953) Apr. 1.

An enriched C^{13} target was bombarded by 554-kev protons, and the resultant γ radiation was examined with a scintillation pair spectrometer. Gamma-ray lines of the following energies and intensities were observed, the intensities being referred to the 8.06-Mev ground-state transition as 100%: 5.1 ± 0.2 Mev, ~4%; 4.45 ± 0.1 Mev, ~18%; 3.05 ± 0.1 Mev, ~15%; 2.75 ± 0.1 Mev, ~10%; and 2.35 ± 0.1 Mev, ~25%. The region below 2 Mev was not investigated. Four of the observed lines can be fitted into the N^{14} level scheme described by Ajzenberg and Lauritsen (Revs. Mod. Phys. 24, 231(1952)). (L.M.T.)

3225

THE (γ,α) REACTION OF B^{11} AND B^{10}. K. Locher and P. Stoll. Phys. Rev. 90, 164-5(1953) Apr. 1.

In addition to the 3-particle reaction of B^{11} and B^{10} (Helv. Phys. Acta. 25, 451(1952)), the following (γ,α) processes can be initiated with the γ radiation of Li (17.6, 14.8, 12.3 Mev): $B^{11}(\gamma,\alpha)Li^7$, Q = 8.667; and $B^{10}(\gamma,\alpha)Li^6$, Q = 4.453. Beside these transitions to the ground state of Li^7 and Li^6, there also exist transitions to excited levels, which then decay with γ emission: $B^{11}(\gamma,\alpha)Li^{7*}$, $Li^{7*} \rightarrow \gamma + Li^7$; and $B^{10}(\gamma,\alpha)Li^{6*}$, $Li^{6*} \rightarrow \gamma + Li^6$. The excited levels ($E^*$ values) cannot be determined directly as in the case of the 3-particle reaction; the assignment of the events to the E^* values is only possible with help of a detailed knowledge of the incident γ-ray spectrum. (auth)

3226

THE SPECTRUM OF THE γ-RADIATION EMITTED IN THE REACTION $n + p \rightarrow d + \gamma$. A. Bracci, U. Facchini, and

A. Malvicini. Phys. Rev. 90, 162-3(1953) Apr. 1.

The γ spectrum from the $n + p \rightarrow d + \gamma$ reaction was investigated, using neutrons produced by a beam of deuterons focused on a Li target. The ion source was pulsed with ignition periods of the order of 10 μsec which repeated themselves every 150 μsec. The neutrons were slowed down in a 12-cm cube of H_2O, the captured ones producing the γ rays under consideration. A photomultiplier and a scintillation spectrograph employing both NaI and anthracene crystals were used. Spectra are shown for both phosphors. The pulses produced by the γ rays of the d + Li reaction or by the effects of fast neutrons were blocked out with proper circuitry. (L.M.T.)

3227

ANGULAR DISTRIBUTION OF PARTICLES FROM STARS. R. W. Waniek and Taiichiro Ohtsuka. Phys. Rev. 89, 1307-8(1953) Mar. 15. (cf. NSA 7-2370)

The angular distributions in space for each prong produced in nuclear emulsions when bombarded by high-energy neutrons were measured for ~1000 stars in the two plates exposed. The angle of dip was observed together with the projected angle and particular care was taken in determining the shrinkage factor. When the number of prongs is plotted against the spatial angle (either in 10 or 30° intervals), either including all events or excluding 1-, 2-, and 3-prong events respectively, the forward tendency in the emission of the prongs is apparent. In order to determine whether the forward peak is due to high-energy knock-on particles, the angular distribution was plotted by subdivision into prongs with actual ranges over and under 50 μ. From this plot it is noted that the low-energy as well as the high-energy particles are peaked to an appreciable extent in the forward direction. (L.M.T.)

3228

THE PHOTODISINTEGRATION OF THE DEUTERON. Lamek Hulthén and Bengt C. H. Nagel. Phys. Rev. 90, 62-9(1953) April 1.

The photomagnetic and photoelectric cross sections have been calculated for γ energies from threshold (2.23 Mev) up to 20 Mev, using a central Yukawa potential with the same range (i.e., meson mass) in the ^1S and ^3S states and no interaction in the ^3P state. Exchange and quadrupole effects have been neglected. Results are given for three ranges, equivalent to meson masses 199, 256, and 298.5, and are compared with recent measurements. A comparison is made with the results obtained by the effective-range method. 20 references. (auth)

PARTICLE ACCELERATORS

3229

Atomic Energy Research Establishment, Harwell, Berks (England)

A DIVIDED DRIFT-TUBE FOR FOCUSSING A PROTON LINEAR ACCELERATOR. J. S. Bell. Nov. 1952. 8p. (AERE-T/R-1072)

The device proposed uses a focusing principle recently discovered at Brookhaven. The drift tubes of a Berkeley-type accelerator are split into quadrants by longitudinal cuts. Opposite quadrants are kept at the same potential but between adjacent ones an electrostatic potential difference is established. Along the axis there is then a field focusing in one direction and defocusing in the other. Over-all focusing results if after every few drift tubes the field is rotated through a right angle, or alternatively if it is rotated by a small angle between successive drift tubes. A 200-m-long 50- to 500-Mev machine operating at 200 Mc requires potentials of about 12 kv over 0.5-cm gaps. (auth)

3230

Atomic Energy Research Establishment, Harwell, Berks (England)

BASIC ALGEBRA OF THE STRONG FOCUSSING SYSTEM. J. S. Bell. Jan. 1953. 12p. (AERE-T/R-1114)

The methods which were applied by the author to the study of lens focusing and strong focusing in linear accelerators (AERE-T/R-1072) are applied to the problem of betatron oscillations in the new-type proton synchrotron. A quadratic form is introduced to play a role similar to that of the energy of oscillation in simple harmonic motion, and with this the problem of adiabatic variation of oscillation amplitude is solved and a method of discussing misalignments is outlined. Only linear systems are considered and no attempt is made to contribute to the solution of the important problems arising from nonlinearities. (auth)

3231

Radiation Lab., Univ. of Calif., Berkeley

ALTERNATING GRADIENT LENSES FOR REDUCING THE AREA OF A BEAM. Craig Nunan. Mar. 2, 1953. 11p. (UCRL-2117)

In Oct. 1952, it was decided to install electrostatic alternating-gradient focusing lenses in the drift tubes of the Berkeley 31-Mev proton linear accelerator. An arrangement was chosen to simulate focusing in the first four drift tubes of the accelerator with axial spacing between the electrodes. A method is presented for calculating the voltage from each electrode to ground necessary to focus parallel rays to a point, compensating for the axial gaps. The 4-Mev proton beam from the Van de Graaff generator was sent through the 40-ft linear accelerator with power off and was focused as a $\frac{3}{4}$-in.-diameter circle onto a quartz disk at the back of a current cup. As the electrode voltages were raised the spot on the quartz changed from a circle to a progressively smaller rectangle, becoming too small to judge by eye at the calculated voltage. Increasing the voltage produced a progressively larger rectangular spot. Calculations are presented for focusing by a magnet for 31-Mev protons. The magnet has been built but has not been tested. (L.M.T.)

3232

LINEAR ACCELERATOR FOR 3 TO 4 MEV ELECTRONS. Jean Vastel. Compt. rend. 236, 1343-5(1953) Mar. 30. (In French)

A progressive-wave linear accelerator has been operated with sucess. The accelerator guide is fed with h-f power at 500 to 750 kw. The energy of the accelerated electrons centers about the value 3.5 Mev, with an average beam current of 10μA. At 1 m the dose rate is ~10 r/min. (tr-auth)

3233

HIGH-DENSITY CURRENTS OF POTASSIUM IONS. Georges-Albert Boutry and Georges Piétri. Compt. rend. 236, 1350-2(1953) Mar. 30. (In French)

Measurements on the current of K ions produced by a hot W wire in K vapor have been extended to 50 ma/cm^2 and, in a favorable case, to 70 ma/cm^2. Filament temperatures up to >1000°C were used. (G.Y.)

RADIATION ABSORPTION AND SCATTERING

3234

Nebraska Univ.

RANGE OF 10 TO 250 KEV PROTONS AND HELIUM IONS IN VARIOUS GASES. Charles J. Cook, Emerson Jones, Jr., and Theodore Jorgensen, Jr. [1952]. 55p. (AECU-2467)

Integral-type experiments, in which the ionization-extrapolated ranges in gases at low pressures of ions of known incident energy are measured, are among the most accurate for determining range-energy relations. Such investigations have never been reported, however, probably because the criterion for the uniqueness of the ionization-extrapolated range was not known. This criterion was found during the present investigation, carried out with a Cockcroft-Walton accelerator. The experimental apparatus is described

in detail. Range-energy relations for protons in H_2, O_2, A, air, N_2, CO, CH_4, N_2O, and CO_2 and for α particles in air, A, and H_2 are presented. It has not been possible to obtain a rate of energy loss from the integral-type experiment that agrees with the results of differential-type experiments, with the exception of H_2, where the scattering is at a minimum. (G.Y.)

3235

Carnegie Inst. of Tech.

DIFFERENTIAL CROSS SECTION FOR ELASTIC p-p SCATTERING AT 435 MEV. W. E. Mott, R. B. Sutton, J. G. Fox, and J. A. Kane. Mar. 5, 1953. 6p. (NYO-3654)

The elastic differential scattering cross section of 435-Mev protons by protons has been measured from 25.2 to 90° (c.m.). A coincidence technique was used and the cross sections were obtained by taking polyethylene-C differences. (auth)

3236

ENERGY PER ION PAIR FOR 5-MEV ALPHA-PARTICLES IN HELIUM. T. E. Bortner and G. S. Hurst. Phys. Rev. 90, 160(1953) Apr. 1.

The average number of ion pairs formed by Pu^{239} α particles in He was measured. A parallel-plate ionization chamber was filled to a pressure such that the α particles (45,500/min) lost all their energy in the sensitive volume. The rate of voltage change on an accurately calibrated condenser was measured by means of a potentiometer. For purified He the w value (ev/ion pair) obtained was 46.0 ± 0.4, which agrees well with values obtained by other investigators for other gases. (L.M.T.)

3237

PARAMAGNETIC SCATTERING OF NEUTRONS BY TRIVALENT IONS OF Nd AND Er. W. C. Koehler and E. O. Wollan. Revs. Mod. Phys. 25, 128-9(1953) Jan.

Neutron diffraction measurements were made on the sesquioxides of Pr and Nd and for the cubic form of Nd_2O_3 and Er_2O_3 in the angular range 3 to 90°. The following conclusions were reached: (1) in each case the cross section for magnetic scattering in the forward direction is in satisfactory agreement with that calculated by replacing $g^2 S(S+1)$ by $g^2 J(J+1)$ in the Halpern and Johnson expression for the magnetic scattering, (2) the angular dependence of the magnetic scattering is similar for Pr_2O_3 and Nd_2O_3 but markedly different for Er_2O_3, and (3) although the cubic form of Nd_2O_3 was prepared to change the electrostatic field acting on the Nd ion, no change in the magnetic scattering was observed. In measurements on these salts down to 20.4°K, no coherent scattering effects suggestive of strong exchange coupling were observed and the diffuse scattering remained constant. (L.M.T.)

3238

ORBITAL EFFECT IN NEUTRON-ELECTRON MAGNETIC SCATTERING. W. H. Kleiner. Phys. Rev. 90, 168-9(1953) Apr. 1.

In this note both the spin-spin and the spin-orbit parts associated with the neutron-electron magnetic interaction are considered in detail with the viewpoint of exploiting the scattering of thermal neutrons from magnetic materials as a tool for investigating the electronic structure of matter. (L.M.T.)

3239

ČERENKOV RADIATION IN A DISPERSIVE MEDIUM. H. Motz and L. I. Schiff. Am. J. Phys. 21, 258-9(1953) Apr.

Attention is called to the disagreement between a recent statement of Sommerfeld that the direction of propagation of Cherenkov radiation in a dispersive medium is determined by the group velocity, and the generally accepted result that the phase velocity must be used. The latter is shown to be correct, and the role of the group velocity is discussed in a way similar to that given in Tamm's 1939 paper on the theory of the Cherenkov radiation. (auth)

3240

RADIATIVE CORRECTION FOR THE COLLISION LOSS OF HEAVY PARTICLES. V. Z. Jankus. Phys. Rev. 90, 4-6(1953) April 1.

The correction to the Bethe-Bloch formula for the stopping power of fast heavy particles, due to virtual photons and the emission of real photons, has been computed using the Born approximation for the extreme relativistic case. The fractional correction increases with increasing energy of the incident particle. It is ~1% when the kinetic energy of the particle is 100 times its rest energy. (auth)

3241

ON THE CONCEPT OF THE EFFECTIVE RANGE IN THE THEORY OF SCATTERING OF NUCLEONS ON NUCLEI. Theodor Sexl. Acta Phys. Austriaca 6, 30-4(1952) Sept. (In German)

It is shown that the recently introduced "effective range," r_{eff} in the terminology of the Guth-Sexl theory of scattering of nucleons on nuclei, has the following property:

$$r_{eff} = -\lim_{k \to 0} \frac{\partial^2}{\partial k^2} \frac{1}{\frac{iC_0}{2k}} \quad \text{(tr-auth)}$$

3242

CROSS SECTION FOR PROTON-PROTON SCATTERING AT LOW ENERGIES. Herbert Überall. Acta Phys. Austriaca 6, 246-9(1953) Jan. (In German)

The equation for the cross section for abnormal scattering by the coulomb field is modified by introduction of an approximation expression, valid at low energies, for the phase shift. (tr-auth)

3243

PAIR PRODUCTION IN HOMOGENEOUS MAGNETIC FIELDS. H. Robl. Acta Phys. Austriaca 6, 105-18(1952) Nov. (In German)

The cross section for pair production by photons is calculated in the first approximation using exact eigenfunctions of electrons in a homogeneous magnetic field. It is assumed that the incident quanta is perpendicular to the magnetic field. For the experimentally available field strength the cross section is vanishingly small if the energy of the quanta is not very great in relation to the rest energy of the electron. (tr-auth)

3244

ENERGY DEPENDENCE OF THE PHASE SHIFT IN PROTON-PROTON SCATTERING. Herbert Überall. Acta Phys. Austriaca 6, 119-34(1952) Nov. (In German)

A potential-series expansion of a simple function of the phase shift with respect to the relative energy of the incident particle is presented. The quantum-mechanical transition conditions for the radical wave function at the nuclear radius r_0 are used. The coefficients of the expansion are calculated in explicit form, in contrast to the integral representation given by several authors, and are found to be modified Bessel functions with an argument dependent on nuclear radius r_0 and on Bohr's radius a. (tr-auth)

3245

A DIFFERENTIAL EQUATION FOR THE FERMI SCATTERING LENGTH IN NEUTRON-PROTON SCATTERING. Theodor Sexl. Acta Phys. Austriaca 6, 329-31(1953) Jan. (In German)

An ordinary differential equation of the first order is derived for the Fermi scattering length, which makes it possible to determine the scattering length in question by eventual numerical integration. An exact solution is possible for the special case of a potential well with $l = 0$. This conclusion is in agreement with earlier results of the author. (tr-auth)

3246
RESOLUTION OF THE "PHOTON DIFFERENCE METHOD". J. Goldemberg and L. Katz. Phys. Rev. 89, 1300-1(1953) Mar. 15.

In determining (γ,n) cross sections from photonuclear reactions by the "photon difference method," some questions arise as to the validity of interpreting the humps in the high-energy side of the cross-section curves as contributions from (γ,2n) and (γ,np) reactions. To further test the method the activation curve was measured for a mixed sample, Cu and Pb, in which the (γ,n) peaks occur at different energies. In the first case, 0.45 mole of Cu and 0.072 mole of Pb were mixed, activation curves were obtained for the mixture and for the Pb and Cu separately, and the cross-section curves determined. Then cross section curves were obtained for 0.23 mole of Cu and 0.072 mole of Pb analyzed similarly. The results show that small changes in the activation curves can distort the shape of the cross-section curves, thus accurate measurements are necessary for obtaining reliable results with the "photon difference method." (L.M.T.)

3247
COMPTON SCATTERING IN A HOMOGENEOUS MAGNETIC FIELD. Hermann Robl. Acta Phys. Austriaca 6, 45-52(1952) Sept. (In German)

The scattering of photons on electrons in a homogeneous magnetic field is investigated in a nonrelativistic approximation. It is assumed that the electrons are found in their lowest energy state before the scattering. The calculation is limited to the special case in which the incident quanta are perpendicular and the scattered quanta are parallel to the magnetic field. It is shown that scattered radiation possesses a spectral band, which contracts to a sharp line, corresponding to scattering on free electrons, at vanishingly small magnetic field strengths. (tr-auth)

3248
DENSITY DISTRIBUTION OF THERMAL NEUTRONS IN A SEMI-INFINITE SCATTERING MEDIUM IRRADIATED BY A FLUX NORMAL TO ITS FACE. J. Bourgeois, J. Jacquesson, and P. Zaleski. J. phys. radium 14, 198-202 (1953) Mar. (In French)

The density distribution of thermal neutrons was studied for the case of a flux perpendicular to the plane face of a paraffin block considered as semi-infinite. The experimental investigation with the aid of a radioautographic method and a theoretical investigation using the integral equation for neutron diffusion without energy change are reported. (tr-auth)

3249
GENERAL CALCULATION OF THE RANGE-ENERGY RELATION OF PARTICLES IN EMULSIONS OR ANY RETARDING MEDIUM; NUMERICAL APPLICATION TO ILFORD C2 EMULSION. Léopold Vigneron. J. phys. radium 14, 145-59(1953) Mar. (In French)

Only one theoretical equation permits extrapolation of the range-energy relation beyond experimental determinations; earlier calculations by the author are repeated and corrected. For $E < 1$ Mev, the empirical measurements of Warshaw (Phys. Rev. 74, 511(1949)) may be used to obtain the energy loss. For higher energies, it is demonstrated that this can be expressed theoretically as a function of two parameters, constant for $E > 13$ Mev and for which the variation is calculable for $1 < E < 13$ Mev. Tables of auxiliary functions are calculated. $R = f(E)$ for any retarding medium can be obtained by integration; three experimental points suffice to furnish the necessary constants. A table of $R = f(E)$ is calculated for $E = 0.1$ to $E = 220$ Mev for the case of protons in Ilford C2 emulsions. Simple transformation formulas permit passing to the cases of other particles. Agreement with experiment is perfect. (tr-auth)

3250
PROTON-PROTON SCATTERING FOR A NUCLEON ISOBAR MODEL. Frank T. Solmitz. Phys. Rev. 89, 1295-6(1953) Mar. 15.

The effect of excited isobaric states on p-p scattering was investigated using a model based on the strong coupling approximation of meson theory. The scattering at 300 Mev (in the lab. system) was calculated and the resulting differential cross sections are presented. The results are in sharp conflict with the large, flat cross section found experimentally. Both ^1S and ^1D phase shifts were found to be negative, leading to destructive S-D interference at 90°. The triplet scattering at 90° could be increased by increasing the depth of the tensor potential U, but even for maximum U the cross section would still be too small. It is thought that isobaric models do not promise any great improvement over the conventional interactions in accounting for the known p-p scattering data. (L.M.T.)

RADIATION EFFECTS

3251
Argonne National Lab.
REVERSIBLE BLEACHING OF A BAND IN THE ABSORPTION SPECTRUM OF DIAMOND. Peter Pringsheim. Mar. 30, 1953. 15p. (AECU-2508; UAC-745)

Most Type I diamonds show in their absorption spectra a sharp line at 415.2 mμ and an adjoining band with a number of peaks in the range 405 to 350 mμ. Neutron bombardment of the diamonds superposes a continuous and continuously rising absorption without any selectivity on the original band. A part of the continuum produced by neutron bombardment is bleached out by heating and irradiating with light. Heat alone, in addition to the bleaching, enhances the band peaks below 403 mμ. (J.S.R.)

3252
Atomic Energy Research Establishment, Harwell, Berks (England)
THE SOLUBILITY AND MOLECULAR SIZE DISTRIBUTION OF CROSSLINKED POLYSTYRENE. A. Charlesby. Nov. 18, 1952. 11p. (AERE-M/R-1034)

When exposed to pile radiation, polystyrene becomes crosslinked, forming a network structure (or gel) which is insoluble in the usual organic solvents. Not all molecules are linked into the network; these remaining molecules form a sol which can be leached out by solvents. On the assumption that all molecules are initially of the same size, Flory has obtained a theoretical expression for the sol fraction, i.e., the proportion of soluble material, in terms of the degree of crosslinking. In this paper a theoretical expression is derived for the sol fraction on the assumption that the molecular sizes are initially distributed at random, i.e., that they follow a Poisson distribution. This expression is extended to cover the case where both crosslinking and chain fracture occur, owing to pile radiation. Measurements of the sol fraction for polystyrene show that the latter formula fits the observed data. Thus the distribution of molecular weight in ordinary polystyrene is shown to follow a Poisson distribution. Chain fracture due to pile radiation is shown to be small or inexistent. (auth)

3253
Atomic Energy Research Establishment, Harwell, Berks (England)
THE SWELLING PROPERTIES OF POLYSTYRENE CROSSLINKED BY HIGH ENERGY RADIATION. A. Charlesby. Nov. 18, 1952. 11p. (AERE-M/R-1051)

The swelling properties of polystyrene, crosslinked by pile radiation, are studied as a function of the degree of crosslinking. The volume swelling ratio V is related to

the degree of crosslinking and the sol fraction s by the relationship:

$$V^{5/3} = (0.5-\mu)\, M_o/\gamma\, (1-s)\, \rho v_1,$$

where M_o is the initial average molecular weight, and μ, ρ, and v_1 are known constants. The power factor ($^5/_3$) predicted on theoretical grounds is observed in the experiments. From the observed swelling in benzene and in toluene the average molecular weight M_o is found to be about 450,000. A similar value is obtained for the weight swelling ratio. The method used in the paper may serve to determine molecular weights in other long chain polymers. Moreover, the swelling of polystyrene may serve as a means of measuring the density flux of ionizing radiations. (auth)

3254

General Engineering Lab., General Electric Co.

EFFECTS OF RADIATION ON ORGANIC MATERIALS. 2. J. W. Ryan. Dec. 5, 1952. 32p. (GEL-57; DF52GL242)

A study of radiation effects on certain thermal insulating materials and varnishes as to gas evolution, tensile strength, elongation and creep, and abrasion resistance is presented and discussed. (auth)

3255

Bausch and Lomb Optical Co.

IRRADIATION DAMAGE TO GLASS. Norbert J. Kreidl. Mar. 12, 1953. 47p. (NYO-3777)

The irradiation damage to glass is being studied in three phases. First, a fundamental investigation is being made of the change of physical properties with irradiation in simple glasses containing controlled simple components; e.g., Ce. Second, the relation between protection, quality, intrinsic color, and composition of glasses required in specific designs are investigated in detail with the aim of developing glasses for particular irradiation levels. Third, instruments incorporating these glasses are being designed for use where resistance to radiation is required. The five glasses selected for development have been "protected" against exposure to 10^6 r γ radiation. Results are given on the change in absorption with exposure of "protected" and not "protected" glass. The development of two of these glasses is completed. The remaining three require some improvement in quality or adjustment of optical properties. The fundamental study is guided by effects and methods known in the case of irradiation of crystals. In a silicate-base glass the ultraviolet absorption bands of Ce are concealed by the characteristic absorption of the glass. By using a phosphate-base glass the Ce absorption bands in the ultraviolet and their change with irradiation were clearly observed. The oxidation level of Ce in silicate- and phosphate-base glasses was controlled. (auth)

3256

THE ALPHA-PARTICLE INDUCED PHOSPHORESCENCE OF SILVER-ACTIVATED SODIUM CHLORIDE. C. E. Mandeville and H. O. Albrecht. Phys. Rev. 90, 25-8 (1953) April 1.

Using as primary excitants ultraviolet light and Po alpha particles, the phosphorescent afterglow of the double-banded phosphor, Ag-activated NaCl, has been measured as a function of the time with photosensitive geiger counters and photomultiplier tubes. The decay curves of the phosphorescent intensity of the two bands can be represented by appreciable different power laws. Decay slopes greater in absolute magnitude than two on a logI—logt plot have been frequently observed. (auth)

RADIOACTIVITY

3257

Los Alamos Scientific Lab.

THE RADIATIONS OF U^{240} AND Np^{240}. J. D. Knight, M. E. Bunker, B. Warren, and J. W. Starner. [1952]. Decl. Apr. 8, 1953. 19p. (AECD-3509; LADC-1355)

The β and γ radiations of U^{240} and Np^{240} have been examined with magnetic-lens and scintillation spectrometers. U^{240} (14.1 ± 0.2 hr) emits a single β-ray group of maximum energy 0.36 Mev. No γ rays were observed. Np^{240} (7.3 ± 0.3 min) emits four β-ray groups with maximum energies of 2.156, 1.59, 1.26, and 0.76 Mev and relative intensities of 52, 31, 11, and 5.4%, respectively. Gamma rays having energies of 1.40, 0.90, and 0.56 Mev were observed. These data can be fitted into a simple decay scheme. On the basis of cycles involving the total decay energies of these isotopes, plus published data on α- and β-transition energies and photoneutron thresholds of related nuclides, the binding energy of the last neutron in U^{240} is calculated to be 5.92 ± 0.15 Mev, and that of the last neutron in Np^{240} to be 4.98 ± 0.15 Mev. (auth)

3258

Argonne National Lab.

SCINTILLATION COUNTING OF NATURAL URANIUM FOILS. Robert C. Axtmann and James S. Stutheit. Dec. 1952. Decl. Mar. 13, 1953. 9p. (AECD-3513; ANL-HDY-715)

A NaI(Tl) crystal used in conjunction with a differential pulse height analyzer is an excellent means for measuring fission-product activation of U foils. The scintillation counter will discriminate against both U^{239} and Np^{239} decay and thus measure only fission-producing flux activation. The counter will also discriminate against fission activity and measure relative amounts of U^{238} capture. This is done by counting γ rays which originate in the decay of Np^{239}. (auth)

3259

Mound Lab.

A CALORIMETRIC DETERMINATION OF THE HALF LIFE OF POLONIUM-210; FINAL REPORT. J. F. Eichelberger, K. C. Jordan, S. R. Orr, and J. R. Parks. Feb. 10, 1953. Decl. Apr. 8, 1953. 13p. (AECD-3515; MLM-807)

Six determinations have been made of the half life of Po with 4 different steady-state, resistance-bridge calorimeters and 5 different samples of Po. These 6 values of the half life have been weighted and combined to give a grand-mean value of the half life of 138.4005 ± 0.0051 days. (auth)

3260

Radiation Lab., Univ. of Calif., Berkeley

NOTE ON THE DECAY OF Rb^{82}. Harry T. Easterday. Apr. 2, 1953. 6p. (UCRL-2172)

The note points out discrepancies between the work of Huddlestone and Mitchell (Phys. Rev. 88, 1350(1952)) on the decay of 6.3-hr Rb^{82} and studies recently made at the Univ. of Calif. Radiation Lab. The activity was produced by bombarding CuBr with α particles, and the beam energy was reduced below the $(\alpha,2n)$ threshold in order to eliminate Rb^{81}(4.7 hr). In following the half lives of the individual conversion electron lines with a β spectrometer the 558-kev line reported to be associated with Rb^{82} was found to exist several days after the 6.3-hr lines had completely decayed. The 423-kev line could not be resolved. The fit of the positron spectrum to the known low-energy γ rays is shown. The 770-kev transition appears to be most intense and is expected to be E2. It is felt that the 187-kev transition is of sufficient intensity to be placed lower in the level scheme than previously assigned. A scheme for the low-energy portion of Rb^{82} decay is presented. (L.M.T.)

3261

Radiation Lab., Univ. of Calif., Berkeley

THE DECAY OF Cr^{49}. Bernd Crasemann and Harry T. Easterday. Mar. 31, 1953. 4p. (UCRL-2173)

Ti foils were bombarded with 40-Mev α particles to produce Cr^{49} by the $Ti^{48}(\alpha,3n)$ and $Ti^{47}(\alpha,2n)$ reactions. A half life of 41.7 ± 0.5 min was found using a trochoidal analyzer.

The positron spectrum was determined using a thick-lens β spectrograph, and Fermi plots constructed from the spectrum yielded three components. Photoelectrons ejected from a Au radiator yielded one set of energy values for the γ rays present. Conversion electrons belonging to the 153-kev line were measured, but no conversion electrons could be found for the 609-kev line. A suggested decay scheme is given. (L.M.T.)

3262

SPECTROMETER MEASUREMENT ON THE HIGH ENERGY POSITRONS OF SODIUM 22. Byron T. Wright. Phys. Rev. 90, 159-60(1953) Apr. 1.

A measurement of the ratio R of the partial decay constant for the lower-energy spectrum to that of the high-energy spectrum of positrons from Na^{22} was made using a solenoidal spectrometer. The 3-mc source was deposited on nylon of thickness 25 mg/cm^2. The detector was a small end-window Geiger counter, the end of which formed the "energy-selecting hole" of the spectrometer. Momentum plots of the observed spectra are shown. From a comparison of the areas under the curves a value of R was determined as 1600 ± 400. This leads to a decay constant for the decay of Na^{22} to the ground state of Ne^{22} of $\geq 5.3 \pm 1.0 \times 10^{-11}$ sec^{-1}. (L.M.T.)

3263

THE ANGULAR CORRELATION OF THE CASCADE GAMMA-RAYS FROM THE DECAY OF Au^{198}. Carlton D. Schrader, Edward B. Nelson, and James A. Jacobs. Phys. Rev. 90, 159(1953) Apr. 1.

Although the β decay of Au^{198} occurs predominantly to the 0.411-Mev level in Hg^{198}, about 2% of the decay occurs to the 1.09-Mev level. The γ decay of the 1.09-Mev level occurs by cascade through the 0.411-Mev level as well as by a direct transition to the ground state (Cavanagh, Phys. Rev. 82, 791(1951)). The author's observed angular correlation of the cascade γ rays determines the spin and parity of the 1.09-Mev level as 2+ in agreement with the internal-conversion results of Elliott and Wolfson, (Phys. Rev. 82, 333(1951)), and the 0.68-Mev radiation has been found to be a 60% quadrupole, 40% dipole mixture. (auth)

3264

EVIDENCE FOR A 25.5-DAY Sr–76-SEC Rb CHAIN. Paul Kruger and Nathan Sugarman. Phys. Rev. 90, 158-9(1953) Apr. 1.

Careful analysis of the decay curves of repurified Sr samples that had been separated from the spallation products of Ag irradiated with 450-Mev protons yielded a half life of 25.5 ± 0.5 days. Although not recognized as a Sr isotope at the time, Castner (Phys. Rev. 88, 1126(1952)) had observed this nuclide and assigned mass No. 82 to it on the basis of proton activation. His search for the Rb daughter, however, led to half-life limits of less than a few minutes or greater than a year, even though a 6.3-hr Rb^{82} had been reported (Phys. Rev. 80, 647(1950)). A search was made for the radioactive Rb daughter of the 25.5-day Sr by dissolving Sr samples and quickly removing the Rb by precipitation; an activity was found in the Rb samples of 76 ± 5 sec. No 6.3-hr Rb^{82} was found. It would appear that the 76-sec daughter of the 25.5-day Sr requires either that the mass assignment for this chain is not 82 or that nuclear isomerism exists with a highly forbidden transition between the 6.3-hr Rb and the 76-sec Rb. (L.M.T.)

3265

RADIOACTIVE DECAY OF Y^{91}. F. L. Boley and D. S. Dunavan. Phys. Rev. 90, 158(1953) Apr. 1.

The 61-day Y^{91} decay was investigated using scintillation counters. The results of this investigation indicate that the decay is by negatron emission only and is unaccompanied by γ rays. An analysis of the β spectrum yielded an end point of 1.54 ± 0.05 Mev and the familiar first-forbidden shape. (auth)

3266

ACTIVITY ASSIGNMENT TO TITANIUM 51. William R. Hammond, D. N. Kundu, and M. L. Pool. Phys. Rev. 90, 156-7(1953) Apr. 1.

The 6-min activity in Ti^{51} was confirmed using enriched isotopes and the following reactions: (1) $Ca^{48}(\alpha,n)$, (2) $Ti^{50}(n,\gamma)$, $Cr^{54}(n,\alpha)$, and $V^{51}(n,p)$. From the four types of reactions, a consistent 6-min activity was observed with an average half life of 5.89 ± 0.2 min, negatrons of energy 1.78 ± 0.1 Mev, and a low-energy γ ray. (L.M.T.)

3267

INTERFERENCE TERMS AND SYMMETRY PRINCIPLES IN THE THEORY OF BETA DECAY WITH MIXED INVARIANTS. S. R. De Groot. Physica 18, 1011-12(1952) Dec. (In English)

A brief note is presented on terms in β-decay theory arising from β-neutrino angular correlation, nuclear orientation, and polarization and on the various symmetry principles postulated to diminish the number of possible linear combinations of interactions. (G.Y.)

3268

THE DECAY OF 65 GALLIUM. A. H. W. Aten, Jr., H. De Wijs, and M. Boelhouwer. Physica 18, 1032-3(1952) Dec. (In English)

Positrons of 2.2 ± 0.2 Mev maximum energy have been found in the decay of Ga^{65} prepared by bombardment of Zn with deuterons of 6 or 8 Mev energy. The statement in the literature that a 53.8-kev γ ray is connected with this isotope is stated to be based on a mistaken assumption concerning its mass number. (G.Y.)

3269

A SEARCH FOR THE DOUBLE BETA DECAY OF 124 TIN AND 96 ZIRCONIUM H. W. Fulbright. Physica 18, 1026-31(1952) Dec. (In English)

Results of coincidence-counter measurements with scintillation detectors set a lower limit of 1.5×10^{17} yr for the lifetime of Sn^{124} double β decay. A lifetime of $6.2 \pm 2 \times 10^{16}$ yr is indicated for the lifetime of neutrinoless double β decay in Zr^{96}. (G.Y.)

3270

THE SARGENT DIAGRAM FOR K-ELECTRON CAPTURE. N. Feather. Physica 18, 1023-5(1952) Dec. (In English)

Difficulties in constructing a Sargent diagram for the electron-capture process are discussed, and a tentative diagram is presented. (G.Y.)

3271

NUCLEON-LEPTON INTERACTION IN β DISINTEGRATION FROM EXPERIMENTAL DATA. R. Nataf. Physica 18, 1013-16(1952) Dec. (In French)

Experimental ft values for β transitions between mirror nuclei and between paired nuclei are applied to determination of the coupling constants for nucleon-lepton interactions. (G.Y.)

3272

EFFECTS OF RADIOACTIVE DISINTEGRATIONS ON INNER ELECTRONS OF THE ATOM. J. S. Levinger. Phys. Rev. 90, 11-25(1953) April 1.

The probability that nuclear emission of an α or β particle causes ionization of a K or L shell of the atom is calculated by time-dependent perturbation theory using nonrelativistic coulomb wave functions. Beta emission (electron or positron) causes an ionization probability of $0.64/Z^2$ and $2.1/Z^2$ per β in the K and L shells, respectively. The use of nonrelativistic wave functions causes an appreciable underestimate in the ionization probability for K electrons of heavy atoms. Screening corrections for the use of coulomb wave functions would increase the ioniza-

tion probabilities by a factor of 1.4 for K electrons and by a factor of 3 or 4 for L electrons. Migdal's result for dipole electronic transitions caused by nuclear α decay are reduced by a factor 25 (for the case of Po^{210}) because of nuclear recoil. Quadrupole matrix elements such as $(r^{-3})_{1s,n'd}$ are evaluated by a new method developed by H. A. Bethe. This method uses the Sommerfeld integral representation for the continuum n'd wave function. Quadrupole transitions are negligible for K electrons, but are the predominant effect for L electrons. The calculated ionization probabilities for Po^{210} are 10^{-7} and 1.1×10^{-4} per α in the K and L shells, respectively. For α decay, screening corrections and higher multipole transitions would both increase the ionization probability for L electrons. 39 references. (auth)

3273

DECAY OF ^{67}Cu AND THE NUCLEAR LEVELS IN ^{67}Zn. R. H. Nussbaum, A. H. Wapstra, and N. F. Verster. Physica 19, 131-4(1953) Jan. – Feb.

The β decay of Cu^{67} into Zn^{67} was investigated to clarify discordant energy-level schemes of Zn^{67} which have recently been proposed. An absorption analysis revealed a complex β spectrum of maximum energy of 550 ± 20 kev and a presumably complex absorption curve belonging to a maximum energy of ~400 kev as second component. A comparison of the γ lines in Zn^{67} from β decay of Cu^{67} and from K capture in Ga^{67} showed (1) the 205-kev line to remain unresolved from the 190-kev line, and (2) the 190-kev transition in Cu^{67} to be the strongest and the 92-kev transition in Ga^{67} the most intense. Measurements of β-γ coincidences with selected γ lines yielded a β component of 450 ± 80 kev in coincidence with the 94-kev line and another component of 370 ± 60 kev in coincidence with the 190-kev line. (L.M.T.)

3274

ENERGIES OF THE α RAYS OF RADIUM AND OF SEVERAL RADIOELEMENTS OF THE Ra AND RaTh FAMILIES. Geneviève Bastin-Scoffier and José Sant'ana-Dionisio. Compt. rend. 236, 1016-18(1953) Mar. 9. (In French)

Use of nuclear emulsions and a large permanent magnet permitting prolonged exposures of weak sources resulted in well-defined α lines from which the following energies were derived: Ra(Ra^{226}), 4.777; Rn(Rn^{222}), 5.482; RaA(Po^{218}), 5.996; ThX(Ra^{224}), 5.679; and Tn(Rn^{220}), 6.278 Mev. The Po α energy 5.299 Mev was used as standard. The values are not corrected for recoil. (G.Y.)

3275

SCINTILLATION SPECTROMETRY (WITH MEASUREMENT OF β-γ COINCIDENCES) OF γ RAYS FOLLOWING Sc^{48} β^- DECAY. Stevan Koicki, René Ballini, and Robert Chaminade. Compt. rend. 236, 1155-7(1953) Mar. 16. (In French)

The Sc^{48} decay scheme published by Nag et al. (NSA 4-1320, 5-189, 5-4612), which involved a Ti^{48} excited state of 12-μsec half life, has been found to be incorrect by coincidence studies with a NaI(Tl) scintillation spectrometer. It is suggested that the half life observed was caused by a radioactive impurity. (G.Y.)

3276

QUANTITATIVE THEORY OF RADIOACTIVE α EMISSION. Johann Herrmann and Theodor Sexl. Acta Phys. Austriaca 6, 288-305(1953) Jan. (In German)

The quantitative theory of radioactive α decay is developed exactly for the case of nonvanishing azimuthal quantum numbers ($l \neq 0$) by the calculation method of complex eigenvalues. For this purpose integral expressions must be set up for the integrals of the Laplace differential equation of the problem and, from these, asymptotic expressions are computed by the saddle-point method. Solution of the complex eigenvalue equation of the problem leads to an equation for the decay constant which contains an explicit dependence on the azimuthal quantum number only in the exponential. (tr-auth)

3277

THE NUCLEAR LEVELS OF ^{48}Ti. M. J. Sterk, A. H. Wapstra, and R. E. W. Kropveld. Physica 19, 135-7(1953) Jan. – Feb.

The results of Hammermesh (Phys. Rev. 87, 528(1952)) that the β^- decay of Sc^{48} was followed by one γ of 1.33 Mev and two of 0.98 Mev, and Peacock and Deutsch (Phys. Rev. 69, 306(1947)) that the β^+ decay in V^{48} was followed by one γ of 1.33 Mev and only one of 0.98 Mev were confirmed when these experiments were repeated. A comparison of the γ scintillation spectra of the two elements showed a marked shift toward the high-energy side of the spectrum for the 0.98-Mev γ peak of Sc^{48} and also showed the peak to be somewhat higher than the similar V^{48} peak. An additional γ of 2.22 ± 0.10 Mev was found in V^{48}, and a decay scheme which includes this ray is proposed. (L.M.T.)

3278

SOME RADIOACTIVE ISOTOPES OF I, Xe AND Cs. A. H. Wapstra, N. F. Verster, and M. Boelhouwer. Physica 19, 138-9(1953) Jan. – Feb.

Scintillation spectrometric observations are reported for Cs^{128} and I^{128}, both of which decay to Xe^{128}, and for Cs^{127}, Cs^{129}, Cs^{132}. (L.M.T.)

3279

INTERFERENCE EFFECTS IN ANGULAR CORRELATIONS. Otto Hittmair. Acta Phys. Austriaca 6, 71-7(1952) Sept. (In German)

Interference of various multipoles in angular correlations are treated on a general, group-theory basis. An especially clear expression is given for the correction factor for the energy spectrum of a β emitter. The β-γ correlations of K^{42} and Rb^{86} are treated. (tr-auth)

3280

CASCADES IN THE GAMMA-RAY SPECTRUM OF $^{214}_{84}$Po. F. Demichelis and R. Malvano. Nuovo cimento (9) 10, 405-18(1953) Apr. 1. (In English)

Coincidence absorption measurements have been conducted on the γ-ray spectrum of Po^{214} observed in the decay of Bi^{214}. A strong γ-ray cascade of 1.120 and 1.761 Mev was observed. On the basis of the authors' results the two level schemes suggested by Rutherford and Surugue are compared. (G.Y.)

3281

BETA-DECAY AND THE SHELL MODEL, AND THE INFLUENCE OF COLLECTIVE MOTION ON NUCLEAR TRANSITIONS. Aage Bohr and Ben R. Mottelson. Physica 18, 1066-78(1952) Dec. (In English)

A brief review of the various evidence on nuclear structure derived from β-decay data is presented together with a discussion of the extent to which this evidence can be interpreted on the basis of the shell model. A suggested modification of the model and its implications for nuclear transitions are discussed. (G.Y.)

3282

BETA DISINTEGRATION, ALLOWED AND FORBIDDEN DECAY. C. S. Wu. Physica 18, 989-1010(1952) Dec. (In English)

Analyzing the ft value of the light mirror nuclei in terms of the nuclear shell model indicates that the β-decay interaction contains Fermi (S or V) and Gamow-Teller (T or A) interactions in approximately equal parts. The absence of 1/E terms in many carefully investigated allowed spectra excludes the mixtures (S,V) and (T,A). The parity-favored unique spectra gives strong additional support to the presence of G-T interactions. The second forbidden spectra $\Delta I = 2$ can be fitted by either (S,T), (V,A), or (V,T), but not (S,A). The reason that this group spectra can be fitted by tensor or polar vector alone is suggested. The apparent allowed shape of the first forbidden spectra with $\Delta I = 1$ strongly favors (S,T) and (V,A) and is against (S,A). (V,T)

is not excluded. The pseudoscalar interaction P has a chance of showing up only in the first forbidden transitions $I = 0 \rightarrow I = 0$. The RaE spectrum can be explained by (P,T) combination, but the order of magnitude of the matrix element $\int \beta\gamma_5$ as compared with $\int \vec{\sigma}.\vec{r}$ requires further investigation. Reliable results from nuclear recoil experiments will help to decide between (S,T), (V,A), or (V,T). 51 references. (auth)

3283

INTERNAL BREMSSTRAHLUNG OF Fe^{55}. A. Michalowicz. J. phys. radium 14, 214-5(1953) Mar. (In French)

No experiment revealing simultaneously the maximum energy of the β spectrum, the spectral shape, and the absolute intensity of the total γ radiation has been reported. Such an analysis has now been made for Fe^{55} with the use of a 4π ionization chamber and a scintillation detector. A maximum spectral energy of 215 ± 10 kev was found, resulting in a total energy, including E_K, for the $Fe^{55} \rightarrow Mn^{55}$ transition of 222 ± 10 kev. A branching ratio N_γ/N_K of $4 \pm 1 \times 10^{-5}$ was measured. (G.Y.)

THEORETICAL PHYSICS

3284

Ames Lab.

VARIATIONAL METHODS FOR PROBLEMS IN RESISTANCE. J. F. Carlson and T. J. Hendrickson. Mar. 15, 1953. 15p. (ISC-324)

The variational methods introduced by Schwinger (unpublished lecture notes, MIT) are applied to the calculation of the resistance of a cylinder subject to given boundary conditions. The problem is formulated in two ways such that upper and lower bounds to the resistance can be obtained. Results are given for a number of trial functions. (auth)

3285

Radiation Lab., Univ. of Calif., Berkeley

NOTE ON COORDINATE TRANSFORMATIONS AND SOLID ANGLE JACOBIAN FOR CHARGED PARTICLES IN A MAGNETIC FIELD. Walter H. Barkas. Mar. 10, 1953. 6p. (UCRL-2126)

Coordinate and solid-angle calculations connected with the helical orbits described by bundles of charged particles leaving a source in a nearly uniform magnetic field are presented. For nonuniform fields the analytic solid angle and coordinate transformations become too complicated to be useful. (L.T.W.)

3286

NUCLEAR SPIN DETERMINATION BY INELASTIC SCATTERING. O. Hittmair. Acta Phys. Austriaca 6, 241-5(1953) Jan. (In German)

The spin dependence of the angular distribution in inelastic scattering and for the general $X_1(a_1,a_2)X_2$ process is derived. A relatively simple expression results from application of the scattering S matrix and Racah coefficients. The special case of a reaction in which X_1 and X_2 have zero spin is treated; pure group-theory methods make possible an unequivocal determination of spins of the levels of the compound nucleus. The angular distributions for the compound levels having spins $\frac{1}{2}$ to $\frac{9}{2}$ are given, a necessary condition being that a_1 and a_2 have spin $\frac{1}{2}$. (tr-auth)

3287

STATISTICAL INTERACTION OF LEPTONS BY MEANS OF A de BROGLIE FIELD. Ferdinand Cap. Acta Phys. Austriaca 6, 35-44(1952) Sept. (In German)

Expressions are derived for the interactions between leptons (electrons, protons, neutrinos) by intervention of an electrically neutral spin-1 field (de Broglie field). (G.Y.)

3288

CALCULATION OF CROSS SECTIONS FOR COULOMB SCATTERING BETWEEN PARTICLES OF SPINS 0, $\frac{1}{2}$, or 1. Gérard Petiau. J. phys. radium 14, 137-44(1953) Mar. (In French)

A simple representation is introduced for the systems of irreducible matrices in the theory of spin-0 and spin-1 particles and applied to the covariant calculation of cross sections of electromagnetic or meson (vector, scalar, or pseudoscalar) coulomb scattering between two particles with 0, $\frac{1}{2}$, or 1 spins. (tr-auth)

3289

THE GENERALIZATION OF THE WKB METHOD TO RADIAL WAVE EQUATIONS. R. H. Good, Jr. Phys. Rev. 90, 131-7(1953) April 1.

There are two difficulties which arise in connection with the usual generalizations of the WKB method to the Schroedinger and Dirac radial wave equations. One difficulty is that, in deriving the approximations, the Dirac radial equation, the Schroedinger radial equation, and the one-dimensional Schroedinger equation are treated nonuniformly so that the approximate solutions are not simply related to each other in the same way that the original equations are. The other difficulty is that the Dirac radial WKB approximation cannot be applied to a certain type of bound state. In this paper it is shown that these difficulties can be avoided by using as the basis for the WKB method, instead of the customary exponential function, the functions which arise in solving the free-particle problem. In the radial problems these are Bessel functions of order integer-plus-one-half. As well as avoiding the difficulties mentioned above, this technique has the following additional advantages. In the radial problems connection formulas across the turning points are not required. The eigenvalue condition for the bound states arises from a comparison of asymptotic expressions in such a way that one would expect the approximate eigenvalues to be close to the exact ones. For a free particle the approximate wave functions become identical with the exact wave functions, so the accuracy of the approximation increases with increasing energy. On the other hand, the approximations based on Bessel functions have the disadvantages that they are clumsier to apply than the usual approximations and that they give especially poor results near the turning points. (auth)

3290

SYMMETRY PROPERTIES OF A UNIVERSAL INTERACTION. D. L. Pursey. Physica 18, 1017-19(1952) Dec. (In English)

It is shown briefly how symmetry properties with respect to the interchange of fermion fields can arise automatically from the mode of formation of the interaction and how they serve to limit the number of possible interactions. (L.T.W.)

3291

SPECTRA OF SYSTEMS OF INTERACTING PARTICLES. Yu. L. Klimontovich and V. P. Silin. Zhur. Eksptl'. i Teoret. Fiz. 23, 151-60(1952) Aug. (In Russian)

Kinetic equations for quantized scattering functions, which are generalizations of known classical equations, are derived. With the help of these equations, the excitation (oscillation) spectra of macroscopic systems of interacting particles are investigated. Quantized dispersion equations, relating the frequency and extinction decrement to vector oscillations of such systems, are found. With neglect of extinction, oscillation spectra of degenerate Bose and Fermi systems with central forces are derived. Studies on systems of charged particles with magnetic interaction are initiated. (tr-auth)

3292

UNIVERSAL FERMI-TYPE INTERACTION. E. R. Caianiello. Physica 18, 1020-2(1952) Dec. (In English; cf. NSA 6-4923, 6-4999, 7-2212)

In studying the possibility that a unique Fermi-type inter-

action may account for all the known four-fermion processes, the first problem is to obtain selection rules forbidding unobserved processes. Some aspects of the problem are considered. (G.Y.)

3293

ON THE MASS OF THE PHOTON. Ferdinand Cap. J. phys. radium 14, 213-14(1953) Mar. (In French)

A new argument for a non-zero mass for the photon is taken from Schroedinger's unitary theory. A mass of 10^{-65} g is proposed. (G.Y.)

URANIUM AND URANIUM COMPOUNDS

3294

SOME PHYSICAL PROPERTIES OF URANIUM HEXAFLUORIDE. D. R. Llewellyn. J. Chem. Soc., 28-36(1953) Jan.

A number of physical constants of UF_6 are determined. The density of the liquid was measured between 65 and 100°C and that of the vapor from 0 to 100°C. The specific heat was determined from −60 to +100°C, and the data were used, together with the vapor-pressure measurements from −15 to +100°C, to calculate a vapor-pressure equation for solid and liquid. The critical temperature, melting point, and heat of melting are recorded. The viscosity, surface tension, and refractive index of the liquid were measured between 65 to 100°C. The thermal conductivity of the vapor was measured at 5 and 105°C, and the viscosity over the temperature range 0 to 200°C. The heat of vaporization of solid and liquid, Sutherland's constant, the mean free path, the parachor, and the molecular refraction have been calculated. (auth)

NEW NUCLEAR DATA

Summary of New Nuclear Data on Half Lives, Radiations, Relative Isotopic Abundances, Nuclear Moments, Neutron Cross Sections, Reaction Energies, and Masses.

Prepared by National Bureau of Standards Nuclear Data Group with the Assistance of Readers.

For a list of the abbreviations used in this section, see NSA, Vol. 7, No. 1, page "SUPPLEMENT 1".

$_{40}Zr^{89}_{49}$ 4.5^m

τ_1	4.25^m	Zr($\leq$24-Mev γ)	

L.Katz, R.G.Baker, R.Montalbetti, Can. J. Phys. 31, 250(1953).

80^h

τ_2	78^h	Zr($\leq$24-Mev γ)	

L.Katz, R.G.Baker, R.Montalbetti, Can. J. Phys. 31, 250(1953).

$_{40}Zr^{95}_{55}$

β^-	99%	0.370	Zr(pile n)	ion chem
	1%	0.84		s
γ		0.721	α = 0.0024	s pe$^-$, ce$^-$

No 0.92 γ

H.Slätis, L.Zappa, Arkiv Fysik 6, 81(1953).

β^-	54%	0.364		s
	43%	0.396		
γ		0.722	α_K = 0.0014*	s ce$^-$
		0.754	α_K = 0.0011*	

$\beta\gamma(\theta)$ b = 0.00 ± 0.03

P.S.Mitteiman, BAPS 28, 3, U10(1953); *verbal report.

$_{41}Nb^{90}_{49}$

τ	14.7^h	d 5.7^{h}Mo	chem
β^+	1.2		Al a

Absorption due to x rays, β^+ or both

R.W.Diamond, Phys. Rev. 89, 1149(1953).

$_{41}Nb^{95}_{54}$ 90^h

τ_1	84^h	d 65^{d}Zr	chem
γ	0.231		s ce$^-$

H.Slätis, L.Zappa, Arkiv Fysik 6, 81(1953).

35^d

β^-	0.159	d 65^{d}Zr		chem
γ	0.745	α = 0.0024		s; ce$^-$

H.Slätis, L.Zappa, Arkiv Fysik 6, 81(1953).

β^-	0.171			sl
γ	0.771	α = 0.0018	K/LM = 2.4*	

E.F.Strucken, A.H.Weber, BAPS 28, 3, U11(1953); *verbal report.

γ	0.774	K/LM = 6.6	s ce$^-$

R.E.Maerker, R.D.Birkhoff, Phys. Rev. 89, 1159 (1953).

$_{41}Nb^{95}_{54}$ 35^d

γ	0.764	s ce$^-$

P.S.Mitteiman, BAPS 28, 3, U10(1953).

$_{42}Mo^{90}_{48}$

τ	5.7^h	Nb^{93}(55-Mev p)	chem
β^+	~1.4?*		Al a
γ	~0.12		Pb a
	~0.25		
	1.1		

*Absorption due to x rays, β^+ or both

R.W.Diamond, Phys. Rev. 89, 1149(1953).

$_{42}Mo^{91}_{49}$ 75^s

τ_1	65.5^s	Mo($\leq$24-Mev γ)

σ (65.5^s)/σ (15.5^m) = 0.2 for E_γ = 18-20 indicating 65.5^s state has larger spin

L.Katz, R.G.Baker, R.Montalbetti, Can. J. Phys. 31, 250(1953).

No 65.5^s activity from Mo (14.4-Mev n,2n); weak activity from Mo (18-Mev n,2n)

J.E.Brolley, Jr., Phys. Rev. 89, 877(1953); 88, 618(1952).

15^m

τ_2	15.5^m	Mo($\leq$24-Mev γ)
β^+	3.3	a

65.5^s level 0.15 ± 0.05 Mev above 15.5^m g.s. from Mo(γ,n) thresholds

L.Katz, R.G.Baker, R.Montalbetti, Can. J. Phys. 31, 250(1953).

$_{42}Mo^{93}_{51}$ 6.7^h

Mass assignment of 6.7^h activity confirmed with ms

		Nb(6.7-Mev d)	chem
γ	0.27		scin
	0.70		
	1.5		

R.Bernas, J.Beydon, Compt. rend. 236, 194(1953).

Mass assignment of 6.7^h activity confirmed with ms

		Nb(25-Mev d)		
γ	0.264	K/LM~2.8	L/M~3	s$\pi\sqrt{2}$ ce$^-$
	0.685			pe$^-$
	1.479			pe$^-$

D.E.Alburger, S.Thulin, Phys. Rev. 89, 1146(1953).

$Tc^{93}_{43\ 50}$ $^{44^m}$ — τ_1 43.5^m Mo^{92}(9.5-Mev p) chem; γ 0.390 α_K = 0.31 K/LM = 5.8 M4 s$\pi\sqrt{2}$ ce$^-$, pe$^-$

Assignment from Nb^{93}(39-Mev α), Mo(~0 to 20-Mev d); formerly assigned to Tc^{92}

H.T.Easterday, H.A.Medicus, Phys. Rev. 89, 752 (1953).

$Tc^{96}_{43\ 53}$ $^{52^m}$ — τ_1 52^m Nb^{93}(13.5-Mev α) s$\pi\sqrt{2}$ ce$^-$; β^+ ~0.01%; γ I.T. 0.034 K/L = 1.2

Assignment from Mo^{96}(9.5-Mev p), Mo(4-Mev p); formerly assigned to Tc^{94}

H.T.Easterday, H.A.Medicus, Phys. Rev. 89, 752 (1953).

$Ru^{103}_{44\ 59}$ — γ (0.499) $\tau < 2 \times 10^{-9}$ s $\beta\gamma$

T.C.Engelder, Phys. Rev. 90, 259(1953).

Rh^{97} ? $_{45\ 52}$ — τ 31^m Ru(28-Mev d) chem; β^+

A.H.W.Aten, Jr., H.Cerfontain, W.Dzcubas, T.Hamerling, Physica 18, 972(1952).

Rh^{98} ? $_{45\ 53}$ — τ 9^m Ru(28-Mev d) chem; β^+ s

A.H.W.Aten, Jr., H.Cerfontain, W.Dzcubas, T.Hamerling, Physica 18, 972(1952).

$Rh^{106}_{45\ 61}$ — γ 100 ± 0.51; 53 ± 0.62; 2 ± 0.87; 7 ± 1.04; 1 ± 1.55 scin

(0.62γ)(0.51γ)(θ) and polarization-direction I = 0+, 2+, 0+

$\gamma\gamma(\theta)$ coefficients 12% lower than theory

J.J.Kraushaar, M.Goldhaber, Phys. Rev. 89, 1081 (1953).

$Pd^{105}_{46\ 59}$ — I 5/2 S

J.Blaise, H.Chantrel, J. phys. radium 14, 135 (1953).

$Ag^{107}_{47\ 60}$ — $\mu(Ag^{107})/\mu(Ag^{109})$ = 0.86627 M

G.Wessel, H.Lew, BAPS 28, 3, Q8(1953).

$Ag^{109}_{47\ 62}$ — $\mu(Ag^{107})/\mu(Ag^{109})$ = 0.86627 M

G.Wessel, H.Lew, BAPS 28, 3, Q8(1953).

$Ag^{110}_{47\ 63}$ $^{270^d}$ — (0.53β)(0.66γ) (0.53β)(0.89γ) (0.53β)(0.94γ) No (0.53β)(1.52γ) No (0.53β)(1.39γ) (0.66γ)(0.89γ) (0.66γ)(0.94γ) (0.66γ)(1.39γ) (0.89γ)(0.94γ) (0.89γ)(1.39γ) (1.52γ)(0.66γ) (1.52γ)(0.76γ) No (1.52γ)(0.89γ)

Results in agreement with Siegbahn decay scheme

S.A.E.Johansson, S.Almquist, Arkiv Fysik 5, 427 (1952).

$Ag^{111}_{47\ 64}$ — $\bar{E}_\beta$ = 0.376 ± 0.014 ic

J.W.Brabant, L.W.Cochran, R.S.Caswell, BAPS 28, 2, DA5(1953).

$Cd^{111}_{48\ 63}$ — Levels 0.72; 0.95 ?; 1.15 — $Cd(n,n')^{49^m}Cd$ E_n = 0.1 to 1.4

Absolute σ consistent with I = 11/2 for $^{49^m}$Cd from statistical model

A.E.Francis, J.J.McCue, C.Goodman, Phys. Rev. 89, 1232(1953).

$In^{111}_{49\ 62}$ — $\gamma\gamma(\theta)$ b = - 0.19 liquid sample

b depends on phase not chemical structure

R.M.Steffen, Phys. Rev. 89, 903A(1953).

$In^{113}_{49\ 64}$ — μ 5.4966 $In(NO_3)_3$; I

$\mu(In^{113})/\mu(In^{115})$ = 0.99787 ± 0.00004

Y.Ting, D.Williams, Phys. Rev. 89, 595(1953).

$In^{115}_{49\ 66}$ — μ 5.5083 $In(NO_3)_3$ $ScCl_3$; I

$\nu(In^{115})/\nu(Sc^{45})$ = 0.901877 ± 0.00005

Y.Ting, D.Williams, Phys. Rev. 89, 595(1953).

$In^{116}_{49\ 67}$ $^{54^m}$ — τ_1 54.14^m ± 0.07 In(pile n)

Counted for 5 half-lives with G-M

K.W.Downes, G.A.Price, R.Sher, V.J.Walsh, BNL-216 (T-33).

τ_1 53.99^m ± 0.06 In(pile n)

Counted for 8 half-lives with β electroscope

E.E.Lockett, R.H.Thomas, Nucleonics 11, No. 3, 14(1953).

$Sn^{113}_{50\ 63}$ $^{112^d}$ — τ 120^d Sn(pile n) chem

No 0.255γ (< 1% of 0.39γ) scin

No 0.401γ (< 10% of 0.39γ)

Y.Deschamps, P.Avignon, Compt. rend. 236, 478 (1953).

No e^-(0.085γ) < 1% of e^-(0.392γ) sl

No e^-(0.255γ) < 1% of e^-(0.392γ)

e^-(0.401γ) not resolvable

e^-_A/e^-_{KLM}(0.392γ) = 0.56

ϵ_L/ϵ_L = 0.08 to 0.17 (if all ϵ to 0.392 level)

Previous value of 0.8 superseded

C.D.Broyles, D.A.Thomas, S.K.Haynes, Phys. Rev. 89, 715(1953).

$Sb^{121}_{51\ 70}$ — q -1.3 S

G.Sprague, D.H.Tomboulian, BAPS 28, 3, Q11(1953).

$Sb^{123}_{51\ 72}$ — q -1.7 S

G.Sprague, D.H.Tomboulian, BAPS 28, 3, Q11(1953).

Sb^{124} 51 73 — 60^d

β^-	14%	0.24	s π
	49%	0.61	
	9%	0.966	
	7%	1.602	
	21%	2.317	F-K plot not linear
2.3β	$\Delta I = 1$,yes ?		Not $\Delta I = 2$,yes
		0.603	α=0.0034 K/LM=7.9 E2 ce^-
		0.641	pe^-
		0.716	
		1.68	
		2.09	
(1.68γ) (0.60γ)*		(2.09γ) (0.60γ)*	

R.J.D.Moffat, N.Lazar, L.W.Langer, BAPS 28, 3, U13(1953); *verbal report.

β^-	10%	0.223	S
	53%	0.609	
	0%	0.871	
	5%	1.581	
	5%	1.658	F-K plot not linear
	21%	2.306	F-K plot not linear
2.3β	$\Delta I = 2$,no ?		Not $\Delta I = 2$,yes
γ		Rel. intensity of ce^-	
		0.604	K : L : M = 100 : 13 : 3
		0.648	K = 5.4
		0.711 ?	
		0.725	K = 7.8
		1.697	K = 3.4

E.P.Tomlinson, S.L.Ridgway, K.Gopalakrishnan, BAPS 28, 3, u12(1953); verbal report.

γ	0.607	K/LM ~ 15	s ce^-

R.E.Maerker, R.D.Birkhoff, Phys. Rev. 89, 1159 (1953).

γ	(0.60)	$\tau < 2 \times 10^{-9}$ s	$\beta\gamma$

T.C.Engelder, Phys. Rev. 90, 259(1953).

γ	(1.70)	(E)1 99.9%	$\gamma\gamma(\theta)$
		$\alpha = 2.6 \times 10^{-4}$	E1
(1.70γ) (0.60γ) (θ)		I = 3,2,0	
I(2.3 level Te^{124}) = 3 -			
(2.06γ) (0.60γ) (θ)		I = 3,2,0	

F.R.Metzger, Phys. Rev. 90, 328(1953).

γ	(1.70)	(E)1 99.9%	$\gamma\gamma(\theta)$
(1.70γ) (0.60γ) (θ)		I = 3,2,0	

J.J.Kraushaar, M.Goldhaber, Phys. Rev. 89, 1081 (1953).

Te^{123} 52 71 — 100^d

γ	(0.159)	$\tau = 1.9 \times 10^{-10}$ s	$e_K^- e_K^-$

R.L.Graham, R.E.Bell, Can. J. Phys. 31, 377(1953).

Te^{125} 52 73 — 58^d

γ	(0.035)	$\tau = 1.6 \times 10^{-9}$ s	$e_L^- e_L^-$

R.L.Graham, R.E.Bell, Can. J. Phys. 31, 377(1953).

γ	0.0355	α_K = 180	pc
		K : L : M = 5.4 : 3.6 : 1.0	
	0.110	α_K = 11	
		K : L : M = 40 : 5.5 : 1.0	

J.G.Balfour, quoted by S.C.Curran, Physica 18, 1161(1952).

I^{126} 53 73

β^-	72.5 †	0.87	I(28-Mev d); sl
	27.5 †	1.26	
β^+	2.7 †	1.21	
γ			sl ce^-, pe^- scin
		0.390	α_K = 0.016 K/LM ≥ 8 E2
		0.67	
ϵ_K/(0.67γ) ~ 1.25*		(0.39γ) / (0.67γ) ~ 1.0	
(~0.9β^+) (0.39γ)		(K x ray) (0.67γ)	

*From comparison with Cs^{137} K x ray/γ value

N.Marty, M.Langevin, P.Hubert, Compt. rend 236, 1153(1953).

I^{131} 53 78

γ	(0.637)	α_K=0.0040 E2	s ce^-, pe^-
	(0.722)	α_K=0.0051 E2	

J.L.Wolfson, Can. J. Phys. 30, 715(1952).

I^{134} 53 81

Mass assignment of 54^m activity confirmed from U(n,f) cumulative yield of 7.7% (Xe^{132} yield = 4.2%, Xe^{134} yield = 8.2%; ms)

L.Yaffe, A.E.Day, B.A.Greer, Can. J. Chem 31, 48(1953).

Xe^{133} 54 79

γ	(0.08)	α_K = 1.8 K/LM = 6	M1
		$\tau = 6 \times 10^{-9}$ s	$\beta^- e_K^-$

R.L.Graham, R.E.Bell, Can. J. Phys. 31, 377(1953).

Xe^{135} 54 81 — 9.2^h

γ	(0.25)	$\tau = 2.8 \times 10^{-10}$ s	$\beta^- e_K^-$
		K/LM = 5.6	

R.L.Graham, R.E.Bell, Can. J. Phys. 31, 377(1953).

Xe^{145} 54 91

Existence of 0.8^{s}Xe activity in doubt Previously reported as p 1.8^hCe^{145}, Q.V.

A.A.Caretto, Jr., S.Katcoff, Phys. Rev. 89, 1267 (1953).

Cs^{134} 55 79 — 2.3^y

γ	0.602	K/LM = 6.6	s ce^-
	0.799	K/LM = 7.8	

R.E.Maerker, R.D.Birkhoff, Phys. Rev. 89, 1159 (1953).

Cs^{137} 55 82

τ	33^y	U(n,f)	chem ms

Calc. from Cs^{137}/Cs^{133} ratios measured between 4.2 and 5.4 years after fission

D.R.Wiles, B.W.Smith, R.Horsley, H.G.Thode, Can. J. Phys. 31, 419(1953).

β^-	0.512	$\Delta I = 2$,yes shape	sl
	1.20	$\Delta I = 2$,no	

C.D.Broyles, D.A.Thomas, S.K.Haynes, Phys. Rev. 89, 715(1953).

γ	0.663	K/LM = 4.52	s ce^-

R.E.Maerker, R.D.Birkhoff, Phys. Rev. 89, 1159 (1953).

Ba^{133} 56 77 — 39^h

γ	(0.012)	$\tau < 0.02^{\mu s}$	

M.Langevin, Compt. rend 236, 689(1953).

$^{140}_{56}Ba_{84}$ γ 0.540 K/LM~6 s ce$^-$

R.E.Maerker, R.D.Birkhoff, Phys. Rev. 89, 1159 (1953).

$^{140}_{57}La_{83}$ γ 0.488 K/LM= 3.7 s ce$^-$

R.E.Maerker, R.D.Birkhoff, Phys. Rev. 89, 1159 (1953).

Ce No fission product Ce with $6^m < \tau < 13.9^m$ chem

A.A.Caretto, Jr., S.Katcoff, Phys. Rev. 89, 1267 (1953).

$^{141}_{58}Ce_{83}$ γ (0.145) $\tau < 2 \times 10^{-9}$ s $\beta\gamma$

T.C.Engelder, Phys. Rev. 90, 259(1953).

$^{145}_{58}Ce_{87}$ No 1.8^hCe activity U(n,f) chem
Previously reported activity due to 2.0^hNd impurity?

A.A.Caretto, Jr., S.Katcoff, Phys. Rev. 89, 1267 (1953).

$^{146}_{58}Ce_{88}$ τ 13.9^m p 24.4^mPr U(n,f) chem
β^- ~0.9 a
γ ~0.2 a

A.A.Caretto, Jr., S.Katcoff, Phys. Rev. 89, 1267 (1953).

$^{141}_{59}Pr_{82}$ μ +3.9 s
Calculated from data of White, Phys. Rev. 34, 1397(1929)

P.Brix, Phys. Rev. 89, 1245(1953).

$^{144}_{59}Pr_{85}$ γ (0.695) $\tau < 2 \times 10^{-9}$ s $\beta\gamma$

T.C.Engelder, Phys. Rev. 90, 259(1953).

$^{145}_{59}Pr_{86}$ No 4.5^hPr activity U(n,f) chem
Previously reported activity due to 3.7^hLa impurity?

A.A.Caretto, Jr., S.Katcoff, Phys. Rev. 89, 1267 (1953).

$^{146}_{59}Pr_{87}$ τ 24.4^m d 13.9^mCe U(n,f) chem
β^- 3.8 a

A.A.Caretto, Jr., S.Katcoff, Phys. Rev. 89, 1267 (1953).

$^{147}_{60}Nd_{87}$ γ (0.092) $\tau = 2.44 \times 10^{-9}$ s
$\alpha_K = 1.8$ K: L: M= 29:4:1

R.L.Graham, R.E.Bell, Can. J. Phys. 31, 377(1953).

Sm Neutron resonances (ev)* E_n = 0.1ev to 40ev
3.43** 19
12 ? 22
15.2

*Isotopic assignment uncertain
**Not Sm 149, 152, or 154

V.L.Sailor, H.L.Foote, Jr., H.H.Landon, Phys. Rev. 89, 904A(1953); priv. comm.

$^{149}_{62}Sm_{87}$ Neutron resonances (ev) E_n = 0.1ev to 40ev
0.094
0.87
4.95

V.L.Sailor, H.L.Foote, Jr., H.H.Landon, Phys. Rev. 89, 904A(1953); priv. comm.

$^{152}_{62}Sm_{90}$ Neutron resonance (ev) E_n = 0.1ev to 40ev
8.20

V.L.Sailor, H.L.Foote, Jr., H.H.Landon, Phys. Rev. 89, 904A(1953); priv. comm.

$^{152}_{63}Eu_{89}$ τ_2 $12.4^y \pm 0.4$ Eu(pile n)
5.3^y Counted for 1.1 years with β electroscope

E.E.Lockett, R.H.Thomas, Nucleonics 11, No. 3, 14(1953).

τ_2 $15.6^y \pm 1.5$ Eu(pile n)
Counted for 200 days with ic

J.Kastner, Can. J. Phys. 31, 169(1953).

$^{152,154}_{63}Eu$ γ 1.40 s π pe$^-$

L.V.Shavtvalov, Zhur. Eksptl' i Teoret. Fiz. 23, 611(1952).

Neutron Cross Sections

Reaction	σ Type	Value	Energy	Ref.
Zr(n)	σ_t	graph	3 - 13	53n1
$Zr^{90}(n,\alpha)$	$\sigma(2.8^h Sr)$	0.2	14.5	53p1
$Zr^{90}(n,2n)$	$\sigma(4.5^m Zr)$	0.08	14.5	53p1
$Zr^{90}(n,p)$	$\sigma(61^h Y)$	0.25	14.5	53p1
$Zr^{94}(n,p)$	$\sigma(18^m Y)$	0.01	14.5	53p1
$Mo^{92}(n,2n)$	$\sigma(15.5^m + 75^s Mo)$	0.19	14.5	53p1
	$\sigma(15.5^m Mo)$	graph	13 - 27	53b6
$Mo^{97}(n,p)$	$\sigma(78^m Nb)$	0.1	14.5	53p1
$Mo^{100}(n,2n)$	$\sigma(68^h Mo)$	3.8	14.5	53p1
$Ru^{96}(n,2n)$	$\sigma(1.6^h Ru)$	0.48	14.5	53p1
$Ru^{101}(n,p)$	$\sigma(15^m Tc)$	0.002	14.5	53p1
Rh(n)	σ_a	4.1	0.15 ev	53b4
$Pd^{104}(n,p)$	$\sigma(4.3^m + 44^s Rh)$	0.13	14.5	53p1
$Pd^{105}(n,p)$	$\sigma(36^h Rh)$	0.7	14.5	53p1
$Pd^{110}(n,\alpha)$	$\sigma(4^m Ru)$	0.014	14.5	53p1
$Pd^{110}(n,2n)$	$\sigma(13^h Pd)$	1.9	14.5	53p1
$Ag^{107}(n,2n)$	$\sigma(24.5^m Ag)$	0.5	14.5	53p1
$Ag^{109}(n,2n)$	$\sigma(2.3^m Ag)$	0.3	14.5	53p1
Cd(n,n')	$\sigma(49^m Cd)$	0.21	1.27	53f3
		graph	0.4 - 1.3	53f3

Reaction	σ Type	Value	Energy	Ref.
Cd(n)	σ_s/σ_a	graph	0.025 - 0.4 ev	53b4
	σ_t	800	0.175 ev	53b4
	σ_t	graph	0.1 - 3	53w2
	σ_t	graph	0.4 - 3.5	52j2
	σ_t	table	37 - 153	53t2
	σ_t	1.84	400	53n2
$Cd^{110}(n,\gamma)$	$\sigma(49^m Cd)$	<0.001	0.2 - 0.4	53f3
$Sb^{121}(n,2n)$	$\sigma(16.6^m Sb)$	0.75	14.5	53p1
$Sb^{123}(n,2n)$	$\sigma(2.8^j Sb)$	1.2	14.5	53p1
Te(n)	σ_t	graph	0.1 - 3	53w2
$Te^{128}(n,2n)$	$\sigma(9.3^h Te)$	0.78	14.5	53p1
$Te^{130}(n,2n)$	$\sigma(72^m + 32^d Te)$	0.60	14.5	53p1
$I^{127}(n,\alpha)$	$\sigma(21^m Sb)$	0.018	14.5	53p1
$I^{127}(n,2n)$	$\sigma(13.0^d I)$	1.1	14.5	53p1
		graph	12 - 18	53m4
$I^{127}(n,p)$	$\sigma(9.3^h Te)$	0.23	14.5	53p1
$I^{127}(n,\gamma)$	$\sigma(25^m I)$	graph	0.25 - 1.6	53m4
$Ba^{138}(n,p)$	$\sigma(33^m Cs)$	0.006	14.5	53p1
$Ba^{138}(n,\gamma)$	$\sigma(58^m Ba)$	0.053	~25 kev	53k4
$La^{139}(n,p)$	$\sigma(85^m Ba)$	0.006	14.5	53p1
$Ce^{140}(n,\alpha)$	$\sigma(2.6^m Ba)$	0.012	14.5	53p1
$Pr^{141}(n,2n)$	$\sigma(3.6^m Pr)$	2.1	14.5	53p1
$Sm^{152}(n,\alpha)$	$\sigma(1.7^h Nd)$	0.009	14.5	53p1
$Sm^{154}(n,2n)$	$\sigma(47^h Sm)$	0.22	14.5	53p1
$Sm_2O_3(n)$	σ_s/σ_a	graph	0.025 - 0.16 ev	53b4
Single level indicated				
$Eu_2O_3(n)$	σ_s/σ_a	graph	0.025 - 0.16 ev	53b4
$Gd^{160}(n,2n)$	$\sigma(18.0^h Gd)$	1.5	14.5	53p1
$Gd_2O_3(n)$	σ_s/σ_a	graph	0.025 - 0.16 ev	53b4
Two levels indicated				
$Dy_2O_3(n)$	σ_s/σ_a	graph	0.025 - 0.13 ev	53b4

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